UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
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DENVER, CO 80202-1129
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Ref: 8ENF-L

March 17, 2011

Mr. Bill Duffy
Counsel for Atlantic Richfield
Davis, Graham & Stubbs
1550 Seventeenth Street, Suite 500
Denver, CO 80202

Re: Order to do Work in Rico, Dolores County, Colorado

Dear Mr. Duffy,

Enclosed please find an Order and Work Plan for Rico, Colorado. The Order requires Atlantic Richfield to perform removal actions in Rico, Dolores County, Colorado. Please note the Order contains an Effective Date of March 23, 2011. Should Atlantic Richfield request a conference, a new Effective Date will apply. Please feel free to contact me with any questions. EPA looks forward to working with Atlantic Richfield through this process.

Sincerely,

Amelia Piggott
Enforcement Attorney
U.S. EPA Region 8
303.312.6410

cc: Carol Pokorny 8ENF-RC, EPA
Steve Way 8EPR-SA, EPA
Matt Cohn 8ENF-L, EPA
Adam Cohen, Davis, Graham & Stubbs
Chuck Stilwell, Atlantic Richfield
Nathan Block, Atlantic Richfield

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 8

IN THE MATTER OF: Rico-Argentine Site Dolores County, Colorado Atlantic Richfield Company, Respondent	UNILATERAL ADMINISTRATIVE ORDER FOR REMOVAL ACTION U.S. EPA Region 8 Docket No. **CERCLA-08-2011-0005** Proceeding Under Sections 104, 106(a), 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §§ 9604, 9606(a), 9607, and 9622

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I. JURISDICTION AND GENERAL PROVISIONS

1. This Unilateral Administrative Order ("Order") is being issued by the United States Environmental Protection Agency ("EPA") to the Atlantic Richfield Company (hereinafter "AR" or "Respondent"). This Order is issued pursuant to the authority vested in the President of the United States by Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9606(a), ("CERCLA"), and delegated to the Administrator of EPA by Executive Order 12580, January 23, 1987, and further delegated to the Regional Administrators by EPA Delegation Nos. 14-14-A and 14-14-B. This authority was further re-delegated by the Regional Administrator of Region 8 to the Director of Preparedness, Assessment and Emergency Response, Office of Ecosystems Protection and Remediation by EPA Delegation Nos. 14-14-A and 14-14-B.

2. This Order pertains to property located at and around the Rico-Argentine Mine in Rico, Dolores County, Colorado ("the Site"). This Order requires the Respondent to conduct removal actions described herein to abate an imminent and substantial endangerment to the public health or welfare or the environment that may be presented by the actual or threatened release of hazardous substances at or from the Site.

3. EPA has notified the State of Colorado of this action pursuant to Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

II. PARTIES BOUND

4. This Order applies to and is binding upon Respondent and Respondent's directors, officers, employees, agents, successors and assigns. Any change in ownership or corporate status of Respondent including, but not limited to, any transfer of assets or real or personal property shall in no way alter Respondent's responsibilities under this Order.

5. Respondent shall ensure that its contractors, subcontractors and representatives receive a copy of this Order and comply with this Order. Respondent shall be responsible for any noncompliance with this Order.

III. DEFINITIONS

6. Unless otherwise expressly provided herein, terms used in this Order which are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Order or in the attached appendices and incorporated hereunder, the following definitions shall apply:

a. "Action Memorandum" shall mean the EPA Action Memorandum relating to the Site signed on January 11, 2011, by the Regional Administrator, Region 8, or his

delegate, and all attachments thereto. The Action Memorandum is attached as Appendix 1.

b. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601 et seq.

c. "Day" shall mean a calendar day. In computing any period of time under this Order, where the last day would fall on a Saturday, Sunday or Federal holiday, the period shall run until the close of business of the next working day.

d. "Effective Date" shall be the effective date of this Order as provided in Section XXII.

e. "EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.

f. "Interest" shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.

g. "National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substance Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

h. "Order" shall mean this Unilateral Administrative Order, all appendices attached hereto and all documents incorporated by reference into this document including without limitation EPA-approved submissions. EPA-approved submissions (other than progress reports) are incorporated into and become a part of the Order upon approval by EPA. In the event of conflict between this Order and any appendix or other incorporated documents, this Order shall control.

i. "Paragraph" shall mean a portion of this Order identified by an Arabic numeral.

j. "Parties" shall mean EPA and Respondent.

k. "Respondent" shall mean the Atlantic Richfield Company.

l. "Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs that the United States incurs in reviewing or developing plans, reports and other items pursuant to this Order, including but not limited to payroll costs, contractor costs, travel costs, laboratory costs, and the costs incurred pursuant to Paragraph 37 (cost of attorney time) and Paragraph 42 (emergency response).

m. "Section" shall mean a portion of this Order identified by a Roman numeral.

n. "Site" shall mean the Rico-Argentine Superfund Site, located in Rico, Dolores County, Colorado and depicted generally on the map attached as Appendix 2.

o. "State" shall mean the State of Colorado.

p. "Waste Material" shall mean 1) any "hazardous substance under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); 2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); 3) any "solid waste" under Section 1004(2) of the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. § 6903(27); and 4) any "hazardous material" under 6 CCR 1007-3 et seq.

q. "Work" shall mean all activities Respondent is required to perform under this Order, as more particularly described in the Removal Action Work Plan, dated March 10, 2011 ("Work Plan"), a copy of which is attached hereto and incorporated herein as Appendix 3, and any approved Work Plan modification made in accordance with Section IX of this Order.

IV. FINDINGS OF FACT

7. The Rico-Argentine Site is located in southwest Colorado, 25 miles southwest of the town of Telluride and just north of the town of Rico, within the northeastern corner of Dolores County. The Site is located in the San Juan Mountains, and within the Upper Dolores River Watershed. The Site consists of an adit (known as the St. Louis Funnel) and associated underground mine-workings, as well as a series of settling ponds, some of which are back-filled, some of which contain sludge material. The Site is not listed on the National Priorities List ("NPL").

8. The St. Louis Tunnel adit drains historical mine workings extending several thousand feet into Telescope Mountain and Dolores Mountain to the east and southeast, respectively. The Site is or was directly hydraulically connected to the mine workings of the former Pigeon, Logan, Wellington, Mountain Spring, Argentine, Blaine, and Blackhawk mines in the area. The workings that are connected direct infiltrating groundwater to the St. Louis Tunnel. As groundwater travels through the workings, oxidation of mineralized rock increases the heavy metal concentrations in the discharging water.

9. The discharge from the adit was historically treated with lime precipitation to achieve permitted water quality standards at the outfall into the Dolores River. The lime caused some of the metals in the discharge to become insoluble and precipitate, forming a lime/heavy metal precipitate sludge in the bottom of the settling ponds. In 1996, active treatment of the discharge was discontinued. The permit for the discharge lapsed in 1999 and was not renewed. The ponds were abandoned, and still contain the lime/heavy metal sludge from treatment, currently discharging mine water, and calcine (iron oxide) tailings left over from a historic acid plant operation.

10. Early estimates of pond volume showed approximately 64,000 cubic yards of sludge. Priority ponds 18, 15, 14, 11, and 12 contain 44,200 cubic yards of sludge. Sediment sampling conducted within the pond system since 1996 shows the following ranges of metal concentrations in the pond sludge: 18,000 to 37,700 parts per million ("ppm") zinc; 51.4 to 190 ppm cadmium; 650 to 2,460 ppm copper, and 200 to 957 ppm lead.

11. Pond 18, the pond closest to the adit, impounds approximately 20,000 cubic yards of sludge. In June 2010, sludge and water in Pond 18 were measured to be less than 12 inches from the top of the dike embankment. In October 2010, Atlantic Richfield enacted temporary measures to reduce the volume of Pond 18; however, no permanent actions have been taken. Pond 18 is adjacent to the Dolores River. A release of the sludge in the ponds may have an immediate negative impact on downstream aquatic populations, killing fish and further degrading water quality in the Dolores River.

12. The construction material and geotechnical stability of the settling ponds are unknown. Construction of the ponds was completed in the 1950's, and the ponds have been modified over time. The ponds are surrounded by earthen berms, or dikes. The longest berm runs the entire half-mile length of the west side of the Site, along the Dolores River. The berms are partially armored with riprap. The preliminary flood plan analysis indicates that the ponds lie within the 100-year flood plain; however, the hydraulic conditions that may occur during a flood event have not been evaluated against the embankment armoring.

13. In April 2000, EPA Region 8's Emergency Response Program responded to a request from the Town of Rico to address a breach, due to a lack of maintenance, on the berm of Pond 18. The pond containment failed, and sediments laden with hazardous substances discharged directly into the Dolores River. EPA's response consisted of raising and reinforcing the riverside embankment of the pond, adding an additional culvert between the pond and downgradient ponds, and installing overflow riprap as a backup drain path. EPA's emergency response did not extend to stability analysis of any other ponds.

14. The settling ponds are unlined, and substantial releases of contaminated mine water to the river alluvium occur from leakage. An investigation into flow rates showed that the discharge flow from the adit was 2,200 gallons per minute ("gpm"). Inflow from Pond 18 was 1,600 gpm; Pond 9 inflow was 1,200 gpm; and inflow to Pond 5, which flows directly into the Dolores River, was measured to be 1,400 gpm. This shows approximately 40 percent loss of flow from the ponds due largely to leakage into the alluvial groundwater system.

15. Hazardous substances present in the adit discharge include cadmium, copper, lead, silver, and zinc, all of which are being released into the environment. As presented in the State Water Quality Analysis ("WQA"), the current water quality standard for zinc for that segment of the Dolores River is 269 µg/L (chronic) and 310 µg/L (acute). The results of samples taken directly from the mouth of the St. Louis Tunnel adit in June 2010 revealed dissolved zinc concentrations at 7,700 µg/L. Available historical sample data

indicate that zinc concentrations in the drainage from the adit range from approximately 3,000 µg/L to approximately 5,000 µg/L.

16. In June 2010, the zinc concentration in the discharge from the outfall at Pond 5, flowing into the Dolores River, was 3,900 µg/L. Historical data collected from the Pond 5 outfall indicate that zinc concentrations in the discharge to the river are increasing. Data from outfall reported to the State by the Respondent, for example, show zinc concentrations of 410 µg/L in July 2002, 1,120 µg/L in 2003, and 3,100 µg/L in December 2004.

17. The records of discharge rates from the adit reported in the WQA range from 2 to 3.3 cubic feet per second ("cfs"). The low flow predictions for the Dolores River seasonally range from approximately 3.2 to 45 cfs. Calculations from the WQA indicate that zinc concentrations currently discharging from the pond system outfall would exceed the low flow assimilative capacity of the Dolores River. Similar to zinc concentrations, cadmium concentrations are also expected to exceed water quality standards based on similar potential low flow conditions and recent concentrations in the discharge.

18. In 1944, Rico Argentine Mining Company ("RAMCO") purchased the St. Louis Tunnel from St. Louis Smelting and Refining Company. RAMCO, while operating the mine in Rico, underwent various mergers, and in 1977, was a division of Crystal Exploration and Production Company ("CEPCO"). In 1980, The Anaconda Company ("Anaconda") purchased substantially all of CEPCO's assets in Rico, including the Site. Anaconda was an "owner" or "operator" of the facility at the time of disposal of hazardous substances at the facility, as defined by Section 101(20) of CERCLA, 42 U.S.C. § 9601(20), and within the meaning of Section 107(a)(2) of CERCLA, 42 U.S.C. § 9607(a)(2). In 1977, Atlantic Richfield purchased all of the stock of the Anaconda Company, and in 1981 Atlantic Richfield merged with Anaconda.

V. CONCLUSIONS OF LAW AND DETERMINATIONS

Based on the Findings of Fact set forth above, and the Administrative Record supporting this removal action, EPA has determined that:

19. The Rico-Argentine Site is a "facility" as defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

20. The contaminants found at the Site, as identified in the Findings of Fact above, include "hazardous substances" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

21. Respondent is a "person" as defined by Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

22. Respondent is liable under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

Respondent is the successor to the liabilities of Anaconda under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), and is liable for the performance of response actions and for response costs incurred and to be incurred at the Site.

23. The conditions described in the Findings of Fact above constitute an actual and/or threatened "release" of a hazardous substance from the facility into the environment as defined by Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

24. The conditions at the Site constitute an imminent and substantial endangerment to public health, welfare, or the environment, based on the factors set forth in Section 300.415(b)(2) of the NCP, as amended, 40 C.F.R. Part 300. These factors include, but are not limited to, the following:

a. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;

This factor is present at the Site due the existence of cadmium, copper, lead, silver, and zinc discharging from both the adit and the sediment-laden settling ponds into the Dolores River.

b. Actual or potential contamination of drinking water supplies or sensitive ecosystems;

This factor is present at the Site due to ongoing discharge to the Dolores River, and the existence of over 64,000 cubic yards of sediments and sludges, including cadmium, copper, lead, silver and zinc in the floodplain of the Dolores River.

c. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released; and

This factor is present at the Site due to the high snowfall potential and seasonal runoff from snow melt, and the existence of inadequately designed and constructed settling ponds lying within the 100-year floodplain of the Dolores River.

d. The unavailability of other appropriate federal or State response mechanisms to respond to this release.

This factor is present at the Site due to the absence of State or local resources and authority to implement a response.

25. The actual or threatened release of hazardous substances from the Site may present an imminent and substantial endangerment to the public health, welfare, or the environment within the meaning of Section 106(a) of CERCLA, 42 U.S.C. 9606(a).

26. The removal actions required by this Order are necessary to protect the public health, welfare, or the environment, and are not inconsistent with the NCP and CERCLA.

VI. ORDER

27. Based upon the foregoing Findings of Fact, Conclusions of Law and Determinations, and the Administrative Record for this Site, EPA hereby orders that Respondent comply with all provisions of this Order and any modifications thereto, including, but not limited to, all attachments to this Order, all documents incorporated by reference into this Order and all schedules and deadlines in this Order, attached to this Order, or incorporated by reference into this Order.

VII. NOTICE OF INTENT TO COMPLY

28. Respondent shall notify EPA in writing within 14 days after the Effective Date of this Order of Respondent's irrevocable intent to comply with this Order. Failure of Respondent to provide such notification within this time period shall be a violation of this Order by Respondent.

VIII. DESIGNATION OF CONTRACTOR, PROJECT COORDINATOR AND ON-SCENE COORDINATOR

29. Respondent shall perform the Work itself or retain a contractor(s) to perform the Work. Respondent shall notify EPA of Respondent's qualifications or the name(s) and qualification(s) of such contractor(s) within fifteen (15) business days of the Effective Date of this Order. Respondent shall also notify EPA of the name(s) and qualification(s) of any other contractor(s) or subcontractor(s) retained to perform the removal action under this Order at least fifteen (15) days prior to commencement of such removal action. The proposed contractor must demonstrate compliance with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," (American National Standard, January 5, 1995), by submitting a copy of the proposed contractor's Quality Management Plan ("QMP"). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)," (EPA/240/B-01-002, March 2001) or equivalent documentation as determined by EPA. EPA retains the right, at any time, to disapprove of any, or all, of the contractors and/or subcontractors retained by the Respondent, or of Respondent's choice of itself to do the removal action. If EPA disapproves of a selected contractor or subcontractor, or of Respondent's decision to perform the Work, Respondent shall retain a different contractor and shall notify EPA of that contractor's name and qualifications within fourteen (14) days of EPA's disapproval. Alternatively, Respondent may notify EPA that it will perform the removal action itself, within fifteen (15) days following EPA's disapproval.

30. Within fourteen (14) days after the Effective Date of this Order, Respondent shall designate a Project Coordinator who shall be responsible for administration of all Respondent's actions required by the Order, and shall submit in writing to EPA the designated coordinator's name, address, telephone number, email address, and qualifications. To the greatest extent possible, the Project Coordinator shall be present on

Site or readily available during Site work. EPA retains the right to disapprove of any Project Coordinator named by Respondent. If EPA disapproves of a selected Project Coordinator, Respondent shall retain a different Project Coordinator and shall notify EPA of that person's name, address, telephone number, email address, and qualifications within 5 business days following EPA's disapproval. Receipt by Respondent's Project Coordinator of any notice or communication from EPA relating to this Order shall constitute receipt by Respondent.

a. EPA has designated Steven Way of the Region 8 Emergency Response Program as its On-Scene Coordinator ("OSC"). Respondent shall direct all submissions required by this Order to the OSC at Emergency Response Program (8EPR-SA), 1595 Wynkoop St., Denver, CO, 80202-1129, except as otherwise indicated herein.

IX. WORK TO BE PERFORMED

31. Respondent shall perform, at a minimum, the following removal action in accordance with the Work Plan:

a. Management of precipitation solids in the settling ponds below the St. Louis Tunnel adit discharge, including partial removal of solids from the upper ponds;

b. Construction of an on-Site solids repository in accordance with the siting requirements of the Colorado HMWMD and Dolores County;

c. Investigation of actions that can be feasibly implemented at the collapsed St. Louis Tunnel portal to stabilize the adit opening and consolidate adit flows;

d. Development of a preliminary design (30%) for appropriate hydraulic controls at or near the adit opening to manage flows entering the treatment system;

e. Construction, as appropriate, of hydraulic controls at or near the adit opening to manage flows;

f. Development of a preliminary (30%) design for a new treatment system for the St. Louis Tunnel adit discharge, including upgrades to pond embankments and hydraulic structures. The preliminary design will be based, in part, on the Water Quality Assessment. The preliminary design objective will be achievement of numeric effluent limitations specified under a CDPS permit to be issued by the Colorado WQCD for the discharge from the ponds system to the Dolores River; and

g. Construction of a water treatment system to address the adit discharge.

32. Work Plan and Implementation

a. The final Work Plan is attached to this Order as Appendix 3. Respondent shall prepare and submit a Quality Assurance Project Plan ("QAPP") as part of the Work Plan. The QAPP shall be prepared in accordance with "EPA Requirements for Quality Assurance Project Plans (QA/R-5)" (EPA/240/B-01/003, March 2001), and "EPA *Guidance for Quality Assurance Project Plans (QA/G-5)" (EPA/600/R-98/018*, February, 1998).

b. Respondent shall implement the Work Plan in accordance with the schedule provided by EPA. The Work Plan, schedule, and any subsequent modifications shall be fully enforceable under this Order. Respondent shall notify EPA at least 7 days prior to performing any on-Site Work pursuant to the EPA-approved Work Plan. Respondent shall not commence or undertake any removal actions at the Site without prior EPA approval.

33. Health and Safety Plan

a. Within 30 days after the Effective Date of this Order, the Respondent shall submit for EPA review and comment a plan that ensures the protection of the public health and safety during performance of on-Site work under this Order ("HASP"). This plan shall be prepared in accordance with EPA's Standard Operating Safety Guide (PUB 9285.1-03, PB 92-963414, June 1992). In addition, the plan shall comply with all current applicable Occupational Safety and Health Administration regulations; Hazardous Waste Operations and Emergency Response found at 29 C.F.R. Part 1910. If EPA determines that it is appropriate, the plan shall also include contingency planning. Respondent shall incorporate all changes to the plan recommended by EPA and shall implement the plan during the pendency of the removal actions.

34. Quality Assurance and Sampling

a. All sampling and analyses performed pursuant to this Order shall conform to EPA direction, approval, and guidance regarding sampling, quality assurance/quality control ("QA/QC"), data validation, and chain of custody procedures. Respondent shall ensure that the laboratory used to perform the analyses participates in a QA/QC program that complies with the appropriate EPA guidance. Respondent shall follow the following documents, as appropriate, as guidance for QA/QC and sampling: "Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures," OSWER Directive Number 9360.4-01, April 1, 1990; "Environmental Response Team Standard Operating Procedures," OSWER Directive Numbers 9360.4-02 through 9360.4-08.

b. Upon request by EPA, Respondent shall have such a laboratory analyze samples submitted by EPA for quality-assurance monitoring. Respondent shall provide to EPA the quality assurance/quality control procedures followed by all sampling teams

and laboratories performing data collection and/or analysis. Respondent shall only use laboratories that have a documented quality system which complies with ANSI/ASQC E-4 1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," (American National Standard, January 5, 1995) and "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001) or equivalent documentation as determined by EPA. EPA may consider laboratories accredited under the National Environmental Laboratory Accreditation Program ("NELAP") as meeting the quality system requirements. Respondents shall provide to EPA the QA/QC procedures followed by all sampling teams and laboratories performing data collection and/or analysis.

c. Upon request by EPA, Respondent shall allow EPA or its authorized representatives to take split and/or duplicate samples of any samples collected by Respondent while performing actions under this Order. Respondent shall notify EPA not less than 7 days in advance of any sample collection activity. EPA shall have the right to take any additional samples that it deems necessary.

d. Post-Removal Site Control. In accordance with the Work Plan schedule, or as otherwise directed by EPA, Respondent shall submit a proposal for post-removal site control consistent with Section 300.415(*l*) of the NCP and OSWER Directive No. 9360.2-02. Upon EPA approval, Respondent shall implement such controls and shall provide EPA with documentation of all post-removal site control arrangements. If the State of Colorado issues a Colorado Discharge Permit and a Certificate of Designation, they shall be considered post-removal site controls.

35. Reporting

a. Respondent shall submit a written progress report to EPA concerning actions undertaken pursuant to this Order on the 5th day of each month, beginning the first month after the start of Work, until termination of this Order, unless otherwise directed by the OSC in writing. These reports shall describe all significant developments during the preceding period, including the actions performed and any problems encountered, analytical data received during the reporting period, and the developments anticipated during the next reporting period, including a schedule of work to be performed, anticipated problems, and planned resolutions of past or anticipated problems.

b. Respondent shall submit 3 copies of all plans, reports or other submissions required by this Order, or any approved Work Plan. Upon request by EPA, Respondent shall submit such documents in electronic form.

c. Respondent shall, at least 30 days prior to the conveyance of any interest in real property at the Site, give written notice of this Order to the transferee and written notice to EPA (and the State) of the proposed conveyance, including the name and address of the transferee. The party conveying such interest shall require that the transferee comply with Section IX, Paragraphs 37 and 38 of this Order – Access to Property and Information.

d. Any transferee shall be required to comply with this Order while the Work is being completed. At the completion of the Work, any transferee shall comply with any post-removal site controls.

36. Final Report Within 30 days after all Work has been fully performed in accordance with this Order, with the exception of any continuing obligations required by this Order, Respondent shall submit for EPA review and approval a final report summarizing the actions taken to comply with this Order. The final report shall conform, at a minimum, with the requirements set forth in the Work Plan and in "Superfund Removal Procedures: Removal Response Reporting – POLREPS and OSC Reports" (OSWER Directive No. 9360.3-03, June 1, 1994). The final report shall include a good faith estimate of total costs or statement of actual costs incurred in complying with the Order, a listing of quantities and types of materials removed off-Site or handled on-Site, a discussion of removal and disposal options considered for those materials, a listing of the ultimate destination(s) of those materials, a presentation of the analytical results of all sampling and analyses performed, and accompanying appendices containing all relevant documentation generated during the removal action (e.g. manifests, invoices, bills, contracts, and permits). The final report shall also include the following certification signed by a person who supervised or directed the preparation of that report:

> Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

37. Access to Property

a. Respondent shall provide and/or obtain access to the Site and off-Site areas to which access is necessary to implement this Order, and provide access to all records and documentation related to the conditions at the Site and the actions conducted pursuant to this Order. Such access shall be provided to EPA employees, contractors, agents, consultants, designees, representatives, and State of Colorado representatives. These individuals shall be permitted to move freely at the Site and appropriate off-Site areas in order to conduct actions which EPA determines to be necessary. Respondent shall submit to EPA, upon request, the results of all sampling or tests and all other data generated by Respondent or its contractors, or on Respondent's behalf during implementation of this Order.

b. Where action under this Order is performed in areas owned by or in possession of someone other than Respondent, Respondent shall use its best efforts to obtain all necessary access agreements within 14 days after the Effective Date of this Order, or as otherwise specified in writing by the OSC. Respondent shall immediately notify EPA if, after using its best efforts, it is unable to obtain such agreements. Respondent shall describe in writing its efforts to obtain access. EPA may then assist Respondent in

gaining access, to the extent necessary to effectuate the removal actions described herein, using such means as EPA deems appropriate. EPA reserves the right to seek reimbursement from Respondent for all costs and attorney's fees incurred by the United States in obtaining access for Respondent.

38. Access to Information

a. Respondent shall provide to EPA, upon request, copies of all documents and information within its possession or control or that of its contractors or agents related to activities at the Site or to the implementation of this Order, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence or other documents or information related to the Work.

b. Respondent may assert business confidentiality claims covering part or all of the documents or information submitted to EPA under this Order to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Documents or information determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies documents or information when they are submitted to EPA, or if EPA notified Respondents that the documents or information are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such documents or information without further notice to Respondent. Respondent shall segregate and clearly identify all documents or information submitted under this Order for which Respondent asserts business confidentiality claims.

c. Respondent may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Respondent asserts such a privilege in lieu of providing documents, it shall provide EPA with the following: 1) the title of the document, record or information; 2) the date of the document, record or information; 3) the name and title of the author of the document, record or information; 4) the name and title of each addressee and recipient; 5) a description of the contents of the document, record or information; and 6) the privilege asserted by Respondent. However, no documents, reports or other information created or generated pursuant to the requirements of this Order shall be withheld on the grounds that they are privileged.

d. No claim of confidentiality shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical or engineering data, or any other documents or information evidencing conditions at or around the Site.

39. Record Retention

a. Until 10 years after Respondent's receipt of EPA's notification pursuant to Section XVI (Notice of Completion of Work), Respondent shall preserve and retain all non-identical copies of records and documents (including records or documents in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to the performance of the Work or the liability of any person under CERCLA with respect to the Site, regardless of any corporate retention policy to the contrary. Until 10 years after Respondent's notification pursuant to Section XVI (Notice of Completion of Work), Respondent shall also instruct its contractors and agents to preserve all non-identical copies of records and documents (including records or documents in electronic form) and any additional information of whatever kind, nature or description relating to performance of the Work.

b. At the conclusion of this document retention period, Respondent shall notify EPA at least 90 days prior to the destruction of any such records or documents, and, upon request by EPA, Respondent shall deliver any such records or documents to EPA. Respondents may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Respondent asserts such a privilege, it shall provide EPA with the following: 1) the title of the document, record or information; 2) the date of the document, record or information; 3) the name and title of the author of the document, record or information; 4) the name and title of each addresses and recipient; 5) a description of the subject of the document, record or information; and 6) the privilege asserted by Respondent. However, no documents, reports or other information created or generated pursuant to the requirements of this Order shall be withheld on the grounds that they are privileged.

40. Off-Site Shipments

a. Respondent shall, prior to any off-Site shipment of Waste Material from the Site to an out-of-state waste management facility, provide written notification of such shipment of Waste Material to the appropriate state environmental official in the receiving facility's state and to the On-Scene Coordinator. However, this notification requirement shall not apply to any off-Site shipments when the total volume of all such shipments will not exceed 10 cubic yards.

i. Respondent shall include in the written notification the following information: 1) the name and location of the facility to which the Waste Material is to be shipped; 2) the type and quantity of the Waste Material to be shipped; 3) the expected schedule for the shipment of the Waste Material; and 4) the method of transportation. Respondent shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.

ii. The identity of the receiving facility and state will be determined by Respondent following the award of the contract for the removal action. Respondent shall

provide the information required by Paragraph 40(a) and 40(b) as soon as practicable after the award of the contract and before the Waste Material is actually shipped.

b. Before shipping any hazardous substances, pollutants or contaminants from the Site to an off-Site location, Respondent shall obtain EPA's certification that the proposed receiving facility is operating in compliance with the requirements of CERCLA Section 121(d)(3), 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440. Respondent shall only send hazardous substances, pollutants, or contaminants from the Site to an off-Site facility that complies with the requirements of the statutory provision and regulation cited in the preceding sentence.

41. Compliance With Other Laws

Respondent shall perform all actions required pursuant to this Order in accordance with all applicable local, State, and federal laws and regulations except as provided in Section 121(e) of CERCLA, 42 U.S.C. § 6921(e), and 40 C.F.R. §§ 300.400(e) and 300.415(j). In accordance with 40 C.F.R. § 300.415(i), all on-Site actions required pursuant to this Order shall, to the extent practicable, as determined by EPA, considering the exigencies of the situation, attain applicable or relevant and appropriate requirements ("ARARs") under federal environmental, State environmental, or facility siting laws.

42. Emergency Response and Notification of Releases

a. If any incident, or change in Site conditions, during the actions conducted pursuant to this Order causes or threatens to cause an additional release of hazardous substances from the Site or an endangerment to the public health, welfare, or the environment, Respondent shall immediately take all appropriate action. Respondent shall take these actions in accordance with all applicable provisions of this Order, including, but not limited to, the Health and Safety Plan, in order to prevent, abate or minimize such release or endangerment caused or threatened by the release. Respondent shall also immediately notify the OSC or, in the event of his unavailability, shall notify the Regional Duty Officer (Emergency Planning and Response, EPA Region 8, 303.293.1788) of the incident or Site conditions. If Respondent fails to take action, then EPA may respond to the release or endangerment and reserves the right to pursue cost recovery.

b. In addition, in the event of any release of a hazardous substance, Respondent shall immediately notify EPA's OSC (303.312.6723) and the National Response Center (800.424.8802). Respondent shall submit a written report to EPA within seven (7) days after each release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. This reporting requirement is in addition to, not in lieu of, reporting under CERCLA Section 103(c) and Section 304 of the Emergency Planning and Community Right-To-Know Act of 1986, 42 U.S.C. §11001 et seq.

X. AUTHORITY OF EPA ON-SCENE COORDINATOR

43. The OSC shall be responsible for overseeing the proper and complete implementation of this Order. The OSC shall have the authority vested in an OSC by the NCP, 40 C.F.R. 300.120, including the authority to halt, conduct, or direct any action required by this Order, or to direct any other removal action undertaken by EPA or Respondent at the Site. Absence of the OSC from the Site shall not be a cause for stoppage of work unless specifically directed by the OSC.

44. EPA and Respondent shall have the right to change their designated OSC or Project Coordinator. EPA shall notify Respondent, and Respondent shall notify EPA within 10 days, before such a change is made. Notification may initially be made orally, but shall be followed promptly by written notice.

XI. ENFORCEMENT: PENALTIES FOR NONCOMPLIANCE

45. Violation of any provision may subject Respondent to civil penalties of up to thirty-seven thousand, five hundred dollars ($37,500) per violation per day, as provided in Section 106(b)(1) of CERCLA, 42 U.S.C. § 9606(b)(1). Respondent may also be subject to punitive damages in an amount up to three times the amount of any cost incurred by the United States as a result of such violation, as provided in Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3). Should Respondent violate this Order or any portion hereof, EPA may carry out the required actions unilaterally, pursuant to Section 104 of CERCLA, 42 U.S.C. 9604, and/or may seek judicial enforcement of this Order pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606.

46. All penalties accruing under this Section shall be due and payable to EPA within 30 days of Respondent's receipt from EPA of a demand for payment of penalties. All payments made to EPA under this Section shall be paid by Fedwire Electronic Funds Transfer in accordance with Paragraph 48 or by official bank check made payable to "EPA Hazardous Substances Superfund." Payments shall indicate that the payment is for Stipulated Penalties, shall reference the EPA Region and Site/Spill ID Number (08-BU; OU01), the EPA Docket Number for this action, and the name and address of the party making payment, and shall be sent to:

Regular Mail:	U.S. Environmental Protection Agency Fines and Penalties Cincinnati Finance Center PO Box 979077 St. Louis, MO 63197-9000
FedEx or Express:	U.S. Bank Government Lockbox 979077

U.S. EPA Fines and Penalties
1005 Convention Plaza
SL-MO-C2-GI.
St. Louis, MO 63101

XII. REIMBURSEMENT OF OVERSIGHT COSTS

47. Respondent shall reimburse EPA, upon written demand, for all response costs incurred by the United States in overseeing Respondent's implementation of the requirements of this Order. EPA may submit to Respondent on a periodic basis a bill for all response costs incurred by the United States with respect to this Order. EPA's cost summary, as certified by EPA, shall serve as the basis for payment demands.

48. Within 30 days of receipt of bill, payment shall be made to EPA by Fedwire Electronic Funds Transfer to:

Federal Reserve Bank of New York
ABA: 021030004
Account Number: 68010727
Field Tag 4200 of the Fedwire message should read "D 68010727 Environmental Protection Agency"

a. Respondent shall simultaneously transmit a copy of the check to Martha Walker, 8TMS-F, 1595 Wynkoop, Denver, CO 80202. Payments shall be designated as "Response Costs- Rico Argentine Site" and shall reference the payor's name and address, the EPA site identification number (08-BU), and the docket number of this Order. The total amount to be paid by Respondent pursuant to Paragraph 47 shall be deposited by EPA in the Rico-Argentine Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

49. Interest at the rate established under Section 107(a) of CERCLA shall begin to accrue on the unpaid balance from the day of the original demand notwithstanding any dispute or objection to any portion of the costs.

XIII. RESERVATION OF RIGHTS

50. Except as specifically provided in this Order, nothing herein shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment, or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing herein shall prevent EPA from seeking legal or equitable relief to enforce the terms of this Order, from taking other legal or equitable action as it deems appropriate and necessary, or from requiring Respondent in the future to perform additional activities pursuant to CERCLA or any

other applicable law. EPA reserves the right to bring an action against Respondent under Section 107 of CERCLA, 42 U.S.C. § 9607, for recovery of any response costs incurred by the United States related to this Order or the Site and not reimbursed by Respondent.

XIV. OTHER CLAIMS

51. By issuance of this Order, the United States and EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondent. The United States or EPA shall not be deemed a party to any contract entered into by Respondent or its directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out actions pursuant to this Order.

52. This Order does not constitute a pre-authorization of funds under Section 111(a)(2) of CERCLA, 42 U.S.C. § 9611(a)(2).

53. Nothing in this Order shall constitute a satisfaction of, or release from, any claim or cause of action against the Respondent or any person not a party to this Order, for any liability such person may have under CERCLA, other statutes, or the common law, including, but not limited to, any claims of the United States for costs, damages and interest under Sections 106(a) and 107(a) of CERCLA, 42 U.S.C. §§ 9606(a), 9607(a).

XV. MODIFICATIONS

54. Modifications to any plan or schedule (or the attached EPA Work Plan) may be made in writing by the OSC or at the OSC's oral direction. If the OSC makes an oral modification, it will be memorialized in writing within 5 days; provided, however, that the effective date of the modification shall be the date of the OSC's oral direction. Any other requirement of this Order may be modified in writing by the signature of the Director, Preparedness, Assessment and Emergency Response, Office of Ecosystems Protection and Remediation.

55. If Respondent seeks permission to deviate from any approved plan or schedule (or Work Plan), Respondent's Project Coordinator shall submit a written request to EPA for approval outlining the proposed modification and its basis. Respondent may not proceed with the requested deviation until receiving approval from the OSC pursuant to Paragraph 54.

56. No informal advice, guidance, suggestion, or comment by the OSC or other EPA representatives regarding reports, plans, specifications, schedules, or any other writing submitted by Respondent shall relieve Respondent of its obligation to obtain any formal approval required by this Order, or to comply with all requirements of this Order, unless it is formally modified.

XVI. NOTICE OF COMPLETION

57. When EPA determines, after EPA's review of the Final Report, that all removal actions have been fully performed in accordance with this Order, with the exception of any continuing obligations required by this Order, EPA will provide notice to Respondent. If EPA determines that any removal actions have not been completed in accordance with this Order, EPA will notify Respondent, provide a list of the deficiencies, and require that Respondent modify the Work Plan to correct such deficiencies. Respondent shall implement the modified and approved Work Plan and shall submit a modified Final Report in accordance with the EPA notice. Failure by Respondent to implement the approved modified Work Plan shall be a violation of this Order.

XVII. ACCESS TO ADMINISTRATIVE RECORD

58. The Administrative Record supporting this removal action will be available for review within 60 days after initiation of on-Site removal actions described herein at the Records Center at EPA Region 8 Headquarters, 1595 Wynkoop, Denver, CO 80202, as well as the Rico Town Hall.

XVIII. OPPORTUNITY TO CONFER

59. Within 5 days after issuance of this Order, Respondent may request a conference with EPA. Any such conference shall be held within 14 days after the Effective Date unless extended by agreement of the parties. At any conference held pursuant to the request, Respondent may appear in person or be represented by an attorney or other representative.

60. If a conference is held, Respondent may present any information, arguments or comments regarding this Order. Regardless of whether a conference is held, Respondent may submit any information, arguments or comments in writing to EPA within 14 days following the conference. This conference is not an evidentiary hearing, does not constitute a proceeding to challenge this Order, and does not give Respondent a right to seek review of this Order. Requests for a conference or any written submittal under this paragraph shall be directed to Amelia Piggott, 8ENF-L, 1595 Wynkoop, Denver, CO 80202-1129.

XIX. INSURANCE

61. At least seven (7) days prior to commencing any on-Site work under this Order, Respondent shall secure, and shall maintain for the duration of this Order, comprehensive general liability insurance and automobile insurance with limits of 1 million dollars, combined single limit. Within the same time period, Respondent shall provide EPA with certificates of such insurance and a copy of each insurance policy. In addition, for the duration of the Order, Respondent shall satisfy, or shall ensure that its contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of

worker's compensation insurance for all persons performing the Work on behalf of Respondent in furtherance of this Order. If Respondent demonstrates by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then Respondent need provide only that portion of the insurance described above which is not maintained by such contractor or subcontractor.

XX. FINANCIAL ASSURANCE

62. Within 30 days of the Effective Date, Respondent shall establish and maintain financial security in the amount of $6 million in the form of an irrevocable letter of credit equaling the total estimated cost of the work. Respondent shall send a copy of the letter of credit to Daniela Golden, 8 ENF-RC, 1595 Wynkoop, Denver, CO, 80202-1129.

63. Any and all financial assurance instrument(s) provided pursuant to this Section shall be in form and substance satisfactory to EPA, determined at EPA's sole discretion. In the event that EPA determines at any time that the financial assurances provided pursuant to this Section are inadequate, Respondent shall, within 30 days of receipt of notice of EPA's determination, obtain and present to EPA for approval another form of financial assurance. In addition, if at any time EPA notifies Respondent that the anticipated cost of completing the Work has increased, then, within 30 days of such notification, Respondent shall obtain and present to EPA for approval a revised form of financial assurance (otherwise acceptable under this Section) that reflects such cost increase. Respondent's inability to demonstrate financial ability to complete the Work shall in no way excuse performance of any activities required under this Order.

64. If, after the Effective Date, Respondent can show that the estimated cost to complete the remaining Work has diminished below the amount set forth in Paragraph 62 of this Section, Respondent may, on any anniversary date of the Effective Date, or at any other time agreed to by the Parties, reduce the amount of the financial security provided under this Section to the estimated cost of the remaining Work to be performed. Respondent shall submit a proposal for such reduction to EPA, in accordance with the requirements of this Section, and may reduce the amount of security after receiving written approval from EPA. Respondent may reduce the amount of security in accordance with EPA's written decision resolving the dispute.

XXI. SEVERABILITY

65. If a court issues an order that invalidates any provision of this Order or finds that Respondent has sufficient cause not to comply with one or more provisions of this Order, Respondent shall remain bound to comply with all provisions of this Order not invalidated or determined to be subject to a sufficient cause defense by the court's order.

XXII. EFFECTIVE DATE

66. This Order shall be effective 7 days after the Order is signed by the Regional Administrator or his delegate unless a conference is requested as provided herein. If a

conference is requested, this Order shall be effective on the 7th day following the day of the conference unless modified in writing by EPA.

IT IS SO ORDERED

BY: Carter L. Kimball for DATE: 3/16/11

David Ostrander, Director
Emergency Preparedness, Assessment
and Emergency Response
Office of Ecosystems Protection and Remediation
Region 8
U.S. Environmental Protection Agency

EFFECTIVE DATE: 3/23/11

Removal Action Work Plan

Rico-Argentine Mine Site - Rico Tunnels
Operable Unit OU01 Rico, Colorado

Environmental Protection Agency, Region 8

for **Atlantic Richfield Company**

March 9, 2011

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TABLES

FIGURES

1.0 OBJECTIVES

The following Work Plan describes the tasks, deliverables, and schedule for the Removal Action at the Rico-Argentine Mine Site - St. Louis Tunnel (Site), which is being conducted under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The objectives of this Removal Action include:

A. Reduce the releases of hazardous substances from the St. Louis Tunnel adit (also referred to in this Work Plan as "adit") and settling ponds into the Dolores River; and

B. Manage the discharge from the St. Louis Tunnel adit to control and reduce the flow and/or reduce the metals concentrations to levels deemed protective of water quality and aquatic life in the Dolores River.

2.0 REMOVAL ACTION SCOPE

The scope of this removal action includes the following specific actions and tasks further defined with the associated schedules presented in this Work Plan:

A. Collect and summarize current site data and develop the appropriate technical plans to implement actions required in this Work Plan;

B. Manage precipitation solids currently present in the settling ponds below the St. Louis Tunnel discharge, including solids removal and drying;

C. Design and construct a solids repository for management on site of site wastes, including those currently in the settling ponds and potential future solids from water treatment;

D. Investigate the mine workings and associated hydrogeology to: 1) identify means to stabilize the adit opening and consolidate adit flows, 2) determine if it is feasible to significantly reduce the flow of water from the St. Louis Tunnel without increasing the discharge of mine-impacted water elsewhere in the watershed, and 3) identify locations where control structures may be effective in managing water discharged to a water treatment system;

E. Investigate and develop treatment alternatives for St. Louis Tunnel discharge with one alternative being the existing proven lime precipitation technology;

F. Acquire control of the land necessary to implement the required actions; and

G. Design and construct the water management system components that may include hydraulic controls at the adit portal area, structures to prevent water from entering the mine workings, and water treatment systems to meet applicable effluent limits.

3.0 BACKGROUND

3.1 CURRENT SITE CONDITIONS

Location. The Site is defined in the Administrative Order on Consent (AOC) as the complex of tunnels and other facilities at the Rico Argentine Mine, including the Rico Tunnels Operable Unit (RTOU), OU01, located just north of the Town of Rico, Dolores County, Colorado. The Rico Tunnels Operable Unit, OU01, is defined in the AOC as the portion of the Site consisting of an adit known as the St. Louis

Tunnel, and a series of settling ponds located downgradient of the St. Louis Tunnel adit. The Site is located approximately 0.75 mile north of the northern boundary of the Town of Rico in Dolores County, Colorado (see Figures 3-1 and 3-2). This location is in the SW ¼ of Section 24 and the NW ¼ and SW ¼ of Section 25, T 40 N, R 11 W within the U.S. Geological Survey (USGS) Rico 7.5-minute Topographic Quadrangle. Work performed under this Work Plan will generally be limited to the RTOU.

Topography. The RTOU lies at the base of Telescope Mountain (the lower portion of which immediately adjacent to the RTOU is known as CHC Hill) in a relatively flat area adjacent to the Dolores River (See Figure 3-3). Average elevation is approximately 8,800 feet; maximum relief is on the order of 130 feet. At present the active channel and floodplain of the Dolores River are confined to the western portion of the historic floodplain, and are separated from the ponds by contiguous constructed dikes along the east bank of the river.

Climate. Climate is characterized as semi-arid with long, cold snowy winters and short, moderately wet and warm summers. Monthly and annual climatic data has been compiled by the Colorado Climate Center at Colorado State University for Rico station 57017 from 1893 through 1993. The mean annual temperature is 39°F. The warmest months are June, July, and August with monthly mean temperatures of about 55°F. The coldest months are December, January and February with monthly mean temperatures of about 7°F.

Mean annual precipitation in the Rico area is about 27 inches. Most of this precipitation occurs as snowfall in the fall, winter, and early spring, averaging about 173 inches of snow per year. Average total monthly precipitation ranges between about 1.4 and 2 inches, with June the driest month and July and August the wettest months with almost 3 inches per month on average. The driest fall month is November with about 2 inches on average.

Facilities/Features. The St. Louis Tunnel adit portal is located at the base of CHC Hill in the north-central portion of the RTOU. Water discharges continuously from the adit, with flows varying seasonally (highest flows in early spring, lower flows in summer, fall, and winter). A roofed masonry block structure is still present at what is believed to be the original portal location. The first approximately 200 feet of the tunnel behind the portal structure have collapsed due to uncontrolled grading on the slope above as described further in Section 3.2 (see Figure 3-3).

A series of constructed ponds occupy most of the central and southern portions of the RTOU, as shown on Figure 3-3. Ponds in the active flow-path are, from upgradient to downgradient: Pond 18, Pond 15, Pond 14, Pond 12, Pond 11, and Ponds 9 through 5. Ponds 13 and 10 are not currently in the normal active flow path of the system. Combined Ponds 16 and 17 have been off-line (i.e., no flow or water storage) for many decades. Ponds 1 through 4 are referenced on historic maps but do not currently receive water discharged from the St. Louis Tunnel.

A soils repository, constructed and operated as part of actions under the Rico Townsite Soils Voluntary Cleanup (VCUP), occupies approximately 2.6 acres at the base of CHC Hill in the north-central portion of the RTOU (see Figure 3-3). This repository accepts soils with elevated lead concentrations removed from the Town of Rico. The repository has a capacity at full build-out of 40,000 cubic yards.

The abandoned metal building and adjacent steel silo of the original lime addition plant are present near the portal of the St. Louis Tunnel (see Figure 3-3). All lime handling, mixing, and feed equipment has been removed from the building and silo.

Utilities. The only active utilities at the RTOU are electric power and telephone lines. Both services are characterized by overhead wires on shared wooden poles. The electrical service provider is San Miguel Power Authority and telephone service is provided by Farmers Telephone Company.

Access. The RTOU is accessed via approximately 0.75 mile of an existing gravel road from Colorado State Highway 145 as shown on Figure 3-3. Highway 145 provides access from Telluride (27 road miles) and Montrose (86 road miles via US Highway 550 and then State Highway 62) to the north and from Cortez (50 road miles) and Durango (92 road miles via US Highway 160 and State Highway 184) to the south (see Figure 3-1).

3.2 SITE HISTORY

Significant mining began in the Rico area in the early 1900s and flourished around the First World War at the Mountain Spring-Wellington mine in CHC Hill just north of the St. Louis Tunnel. Mining in the immediate area was expanded with the driving of the St. Louis Tunnel by the St. Louis Smelting & Refining Company (a division of National Lead Company, presently N.L. Industries) during 1930-1931 to explore for deep ore horizons beneath CHC Hill. Available information documents that the upper ponds were present by at least 1956 and the lower ponds by at least 1979.

During 1955 a sulfuric acid plant was constructed and began operation at the RTOU. Roasting of pyrite ore as part of the process to produce sulfuric acid resulted in the generation of fine silt-to sand-size calcine tailings. The calcine tailings were primarily disposed of in Ponds 16 and 17 (not presently in the active flow path of tunnel discharges), as well as in the bottom of Pond 15 (which is in the existing flow path).

Rico Argentine Mining Company ceased most mining operations in 1971 and allowed deeper workings beneath Silver Creek to flood. During 1973 to 1975, Rico Argentine Mining Company operated a leach heap just northwest of the St. Louis Tunnel, immediately adjacent to the Dolores River. All mining activities by Rico Argentine Mining Company ended in 1976-1977, and exploration work ceased in 1978.

In 1980, the Anaconda Company (Anaconda) acquired Rico Argentine Mining Company's surface and mineral properties in the Rico area. Anaconda conducted exploration drilling from 1980 to 1983, resulting in discovery of a deep molybdenum ore body beneath Silver Creek. Several of these borings were located within the RTOU. Development of this deposit was not deemed economical, and Anaconda never produced ore in Rico. During this same time period, reportedly as described below, Anaconda performed environmental clean-up in the District, including at the RTOU. The acid plant and associated structures at the RTOU were demolished, and the area of the former plant was regraded, capped with a soil cover, and revegetated in 1985 and 1986. Other miscellaneous grading has apparently occurred at various locations in the northern portion of the RTOU.

As part of the acquisition of Rico Argentine Mining Company's surface and mineral properties in 1980, a pre-existing National Pollutant Discharge Elimination System (NPDES) permit (No. CO-0029793) was transferred to Anaconda. In 1983 water from the Blaine Mine on Silver Creek (outfall 002 under the original NPDES permit) was redirected to the St. Louis Tunnel and the Blaine Tunnel (or adit) became zero discharge. In 1984 the Anaconda Company began operation of a new slaked lime addition plant to treat mine water discharge from the St. Louis Tunnel as it entered the ponds system. Between 1984 and 1995, multiple property owners continued the slaked lime addition to the tunnel discharge to improve water treatment and solids removal. Reportedly, around 1996 use of the slaked lime system was discontinued and mechanical components were removed (the plant building is still present at the site). The NPDES permit expired in 1999.

In 2001, Atlantic Richfield reportedly collected the dispersed surface flows from the tunnel portal collapse area into a common channel, diverted the flow through a Parshall flume, and re-routed it to Pond 18. Atlantic Richfield also cleared and maintained existing hydraulic facilities/structures and constructed new controlled overflows (spillways) in the ponds flow system at various times over the past approximately 10 years. In 2002, EPA-Region 8 performed an Emergency Removal Action to prevent overflow from pond 18 into the Dolores River. In the fall of 2010, Atlantic Richfield performed actions to provide for additional normal freeboard and spillway capacity at Pond 18.

4.0 SUMMARY OF PREVIOUS WORK

The following series of investigations and related activities relevant to tasks described in this Work Plan have been completed by Atlantic Richfield. Copies of this existing information and reports obtained or developed by or for Atlantic Richfield regarding water treatment (e.g., treatability studies, technology reviews, water quality, solids handling, hydrogeology, etc.) applicable to the Site will be submitted to EPA prior to April 1, 2011. In addition, mine maps and site models related to the underground mine workings and analysis of mine water flow paths within the mine workings and discharges from the St. Louis Tunnel and other mine openings at the Site will be submitted to EPA. Work plan tasks described below may be modified based on review of these documents. Technical summaries of these reports and study findings with supporting data and observations will be presented as supporting information in related plans and designs required in this Work Plan.

Site Topographic Mapping and Surveying. Topographic mapping of the Site from aerial photography is available from 1980 (Intrasearch – 5-foot contour interval; Anaconda Company site datum), 1994 (Olympus – 2-foot contour interval), and 2004 (Aerodata – 2-foot contour interval). Ground surveying of various locations and features has also been conducted at various times, including in association with soil lead VCUP operations at the staging area and Soil Lead Repository site immediately north of the St. Louis Tunnel, and to support ongoing improvements to the hydraulic functioning and safety of the existing ponds system.

Surface Water and Groundwater Monitoring. Monitoring of surface water flow and quality at and in the vicinity of the RTOU has occurred at varying locations and frequencies since 1978. A more regular program of surface water sampling and analysis was implemented in 1999, followed by adoption of a formal, regulatory Sampling and Analysis Plan in 2003. A total of 21 sampling events were conducted from 2001 through 2006 by Atlantic Richfield, ranging from a minimum of two to a maximum of eight events per year. The CDPHE conducted groundwater sampling and analysis in 2002 and 2003. Atlantic Richfield conducted groundwater monitoring from 2004 to 2007.

Geochemical Sampling and Analysis of Pond Bottom Settled Solids. As part of a broader study to characterize and develop recommendations for upgrades to the prior lime addition treatment system, Kathleen Paser performed detailed field sampling and field and laboratory geochemical analyses of the settled treatment solids in Ponds 18, 11, 9, and 5 (Paser 1996).

Tunnel Discharge Treatability Studies. Alternative methods for treating discharge were investigated, including the previously used lime amendment. Lime addition rates were evaluated for their potential to achieve potential water quality discharge standards, and solids production rates were characterized.

Whole Effluent Toxicity (WET) Testing. Laboratory studies were conducted to evaluate the potential of treated effluent to meet WET requirements associated with a point-source surface water discharge permit. The primary objective of these studies was to identify the probable sources of toxicity in St. Louis Ponds discharge water to the indicator species (*Ceriodaphnia dubia*).

Mixing Zone Evaluation. Field surveys and flow measurements were utilized to confirm that discharges from the St. Louis Ponds would adequately mix with the receiving stream (Dolores River) during low flows within regulatory distances. The methodology and results of the mixing zone evaluation are presented in Technical Memorandum on Mixing Zone Analysis for the St. Louis Ponds Discharge, Rico, Colorado, July 1, 2008 (Atlantic Richfield Company 2008).

Water Quality Assessment. A Water Quality Assessment (WQA) issued by the Colorado Department of Public Health and Environment (CDPHE) in 2008 is expected to be the basis for the water quality discharge permit for the water treatment system (CDPHE 2008). Atlantic Richfield provided input on the preliminary draft, followed by several years of additional watershed sampling, laboratory analysis, and data evaluation that were incorporated into the 2008 WQA.

Solids Handling, Dewatering, and Disposal Studies. Both existing and lime-amended solids were studied in laboratory (vacuum filter, column settling/consolidation), pilot-scale (field dewatering cells; small-scale field solids generation), and full-scale (Pond 18 dewatering and solids removal) tests, in order to identify and evaluate methods for settling, relocating, dewatering, and safely storing treatment solids

Site Geologic/Geotechnical and Groundwater Investigations/Exploration. Geologic, geotechnical, and groundwater conditions at the RTOU have been investigated by site geologic reconnaissance and mapping, field exploration (including monitoring wells, exploratory borings, and test pits), geotechnical laboratory testing, and groundwater sampling and analyses on a number of occasions from 1981 to 2004.

Soil Lead Repository Design and Construction. Studies were completed to identify a feasible location for a repository to contain lead-bearing soils removed from yards/lots in the Town of Rico under the Townsite Soils VCUP. The repository was designed, permitted, and initial construction completed by 2005. Though the future use of this repository is dedicated to soil from the Town of Rico, its design and regulatory requirements are similar to what is anticipated for the repository for water treatment solids disposal to be developed under this Work Plan.

Mine Mapping of Underground Workings and Geologic Structures. Existing mapping is available and any computerized three dimensional mapping that has been developed or can be developed from existing mine plans will be provided and used in the reconnaissance phase of the mine source water investigation. This information will be used to assist with identifying areas of potential influent water to the mines including near surface workings, major geologic structures, flow paths within the workings, and other features of the mine system that may be relevant to developing alternatives for source controls.

5.0 TASK DESCRIPTIONS

The Removal Action will be conducted in accordance with the following plans and the plans referenced in subsequent sections.

- A site-specific health and safety plan will be prepared, submitted, and implemented for all on-site activities.
- A sampling and analysis plan and quality assurance project plan shall be prepared and approved prior to all sampling activities.
- A construction quality assurance/quality control (QA/QC) plan will be prepared and approved prior to construction activities

5.1 TASK A – PRE-DESIGN AND ONGOING SITE MONITORING

A surface water monitoring program will be implemented to further characterize the seasonal water quality and flow rates of the St. Louis Tunnel discharge, selected locations within the ponds system, the St. Louis Ponds outfall, and several locations along the mainstem Dolores River. The objective of this task is to assist in determining site conditions that will affect the design and implementation of various elements of the removal action and related site investigations. Water quality and flow monitoring will be conducted in accordance with an EPA-approved Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP).

Additional sampling that may be needed to ensure the drying facility, repository, and other removal actions do not adversely affect groundwater and surface water will be identified by EPA and implemented under an approved SAP/QAPP.

5.1.1 Subtask A1 – Ongoing Water Quality and Flow Monitoring

Ongoing flow data will be collected at the St. Louis Tunnel discharge and outfall flumes beginning April 1, 2011 and continuing to June 31, 2012. Data recorders will be used to record parameter measurements at least twice daily. Additional water quality parameter data will be collected as needed to support design and operating condition criteria during this period. Following this period, continued monitoring will be performed, but the requirements may be adjusted pending approval by EPA. Data will be downloaded quarterly, at a minimum, maintained in a site database, and provided to EPA.

Historic and current flow, conductivity, and pH data will be evaluated to identify temporal and seasonal trends and to assist in the system investigations and designs performed for other tasks.

River flow/runoff at the USGS Dolores River gauging station downstream of Rico (Gauge No. 09165000) will be evaluated regularly to identify and document representative seasonal flow rates.

5.1.2 Subtask A2 – Seasonal Water Quality and Flow Monitoring

Seasonal flow data and water quality samples will be collected from the St. Louis Tunnel discharge and outfall flumes, selected locations within the Ponds system, and select locations in the Dolores River. Sample locations are listed on Table 5-1 and shown on Figure 5-3. These locations have been sampled historically so existing water quality data can be compared to historical water quality in addition to comparisons against state water quality standards and proposed Colorado Discharge Permit System (CDPS) discharge standards.

Monthly samples will be collected from the Dolores River downstream of the proposed mixing zone in the Dolores River and analyzed for hardness. The hardness values will be used to supplement the data available at the time of the WQA. The WQA identified the available hardness data as limited, and more current data will be used to confirm the analysis of the hardness condition of the water body.

Seasonal monitoring will be performed during the following timeframes:

- Low Flow (January/February)
- Peak Flow (April/May)
- Moderate to Low Flow (October/November)

Samples will be analyzed in the field for pH, temperature, and conductivity. Samples will be analyzed at a laboratory for alkalinity, hardness, total dissolved solids, total suspended solids, sulfate, and total and dissolved metals. The list of proposed analyses is shown on Table 5-2. These analytes were selected to assist in evaluation and development of water treatment system design and demonstrate compliance with anticipated permit requirements based on the water quality assessment (CDPHE WQCD 2003). Additional analyses may be added as needed to meet these purposes. Sampling procedures, analytical methods, and other sampling requirements will be specified in the SAP/QAPP.

Historical and current water quality data will be evaluated to identify temporal and seasonal trends and assist in water treatment, mine workings, and portal flow consolidation studies and designs.

5.2 TASK B – MANAGEMENT OF PRECIPITATION SOLIDS IN THE UPPER SETTLING PONDS

The primary objective for this task is to reduce releases of hazardous substances from the pond system and increase the pond capacity to provide adequate detention time and space for future accumulation of settled solids.

The objective will be met by removing solids from the ponds and stabilizing the ponds to ensure appropriate protection against flooding or erosion associated with Dolores River flood stage flows. A Solids Removal Plan will be developed to describe removal, drying, and placement of solids in an on-site repository. The drying facility(ies) will be designed and constructed, and solids will be managed in accordance with the Solids Removal Plan. Pond stability will be evaluated and necessary upgrades implemented to prevent the release of pond contents. Pond stability work may be performed in conjunction with work described in Task F. Detailed plans for accomplishing these tasks are described below. Interim management and/or treatment of waste streams generated as part of the Removal Action will be performed, as needed, to ensure that there are no increases in hazardous substance in the on-going releases to the Dolores River and that water quality is protected during these actions.

If the initial scoping of water treatment alternatives includes technologies that do not require solids disposal or that would result in significantly different solids properties, the portions of this task related to solids generated by future water treatment may be postponed, modified, or deleted at the discretion of EPA.

Background

Solids have accumulated in the upper ponds as a result of precipitation and settling of metal complexes by natural processes and by addition of lime to the St. Louis Tunnel discharge from 1984 to 1995. Additional solids may be generated as a result of future water treatment at the site.

Atlantic Richfield reports that an inventory of existing solids was performed in 2001 by precision surveying utilizing a sampling boat outfitted with a survey prism and depth sounding rods. The reported calculated volumes of solids based on the field surveys were as follows:

- Pond 18 – 20,000 cubic yards
- Pond 15 – 11,000 cubic yards
- Pond 14 – 2,600 cubic yards
- Pond 13 – not inventoried due to unsafe surface access

- Ponds 11 and 12 – 10,600 cubic yards

The solids volumes shown above are estimated quantities and do not include additional solids that have likely been deposited since the time of this study. Pond 18 solids volume may have been reduced to during a subsequent in-situ dewatering test performed by Atlantic Richfield.

Based on reported Atlantic Richfield testing of recovered minimally disturbed core samples, the settled solids were estimated to have a weighted average percent solids density (weight of dry solids/total wet weight) of 12.9 percent and an average specific gravity of 2.42. Assuming these parameters, Atlantic Richfield estimated that there are a total of approximately 12.4 million pounds of solids (dry weight) present in the ponds system. Relatively few settled solids were observed below Pond 11 and those ponds were not included in the 2001 inventory. These numbers are estimates because the sludge properties may have changed since 2001.

5.2.1 Subtask B1 – Develop Initial Solids Removal Plan

A Solids Removal Plan will be prepared to describe removal, drying, and placement of solids in an on-site repository. The Solids Removal Plan will focus on management of solids currently in the ponds and creating the infrastructure for long-term solids management. Long-term solids management will be addressed more thoroughly, if necessary, as part of the water treatment design and operations and maintenance plan.

The following sections provide the approach to developing the Solids Removal Plan. The plan may be amended as additional information becomes available. Plan modifications will be approved by EPA prior to implementation.

5.2.1.1 Compile, Review, and Evaluate Existing and New Data

Data from previous site investigations and laboratory testing of accumulated solids in the upper ponds will be compiled, reviewed for relevance to the planned initial removal, and evaluated to support development of appropriate removal means and methods.

Additional data needed to support the Solids Removal Plan will be identified and collected. Potential data needs include updated site and solids conditions, geotechnical surveys, and hydrologic/hydrogeologic analysis.

5.2.1.2 Evaluate Removal and Drying Alternatives for Current Pond Contents

The following removal and drying alternatives have been evaluated by Atlantic Richfield or used at the site. The evaluation may be updated in the Solids Removal Plan based on more current data. Other methods and technologies, such as dewatering bags/geotextile tubes, for drying saturated solids may be appropriate under the conditions at the Site. An analysis of such alternatives will be presented in the Solids Removal Plan.

Removal. Two previously identified alternatives will be further evaluated to arrive at one or more acceptable procedures to remove and transport solids from the subject ponds. The preferred alternative is use of conventional earthmoving equipment, which will involve the following steps: 1) routing incoming flow around the pond from which solids are to be removed to the next downgradient pond in the flow path; 2) decanting and pumping off surface water from the pond, allowing initial solids consolidation in place; 3) excavation with conventional earthmoving equipment; and 4) truck hauling to a temporary on-site drying facility.

If the preferred alternative proves infeasible for solids to be removed from beneath the groundwater table, then a dredging alternative would be further evaluated. This alternative would involve the following steps: 1) routing incoming flow around the pond from which solids are to be removed to the next downgradient pond in the flow path; 2) suction dredging from a floating, shallow draft barge with an appropriately designed, continuously agitating suction head; and 3) conveying via pipeline to a temporary on-site combined decant (initial consolidation) and drying facility. If necessary to prove out the feasibility of the dredging alternative, a dredging contractor may be engaged to perform field-scale trial removal at one or more ponds.

Other removal methods will be identified, evaluated, and implemented as needed to accomplish the required work.

Drying. There is not enough flat ground available to allow all solids in Ponds 18, 15, 14, 12, and 11 to be removed and dried at one time, so solids removal and drying will begin with Pond 18 and proceed sequentially through the other upper ponds, as necessary. By using the space in the Pond 16 and 17 area, drying of solids removed from Pond 18 should be completed in 2011. This expectation is due to the prior and ongoing consolidation of solids resulting from removal of surface water from Pond 18 for 10 months in 2001-2002 during a field-scale test of solids removal and again beginning in October 2010 to perform maintenance on the outlet facilities. Solids from Ponds 15, 14, 12, and 11 will be removed in stages over a 1- to 2-year period to complete the initial removal. The dried solids will then be transferred to the solids repository when repository construction is complete.

5.2.1.3 Drying Facility Siting and Layout

The following key issues and criteria will be addressed in the siting and layout of the solids drying facilities:

- An interim drying facility will likely be needed for staging and drying solids removed from Pond 18 in 2011 while Atlantic Richfield completes the final design and construction of a permanent drying facility (to be constructed in conjunction with the solids repository) that can be used for subsequent pond removals and long-term operational needs;

- Adequate area will be needed to spread treatment solids in a relatively thin lift to promote more rapid enhanced drying (dewatering and consolidation);

- Seasonal high groundwater elevations will be identified at potential drying facility locations and the existing grade will be above seasonal high groundwater or there should be an ability to raise grade with earth fill; and

- Final elevation and grade of a drainage system should allow gravity discharge from the drying facility to an approved water treatment system or leachate treatment system.

Atlantic Richfield prefers that the Ponds16 and 17 area be used for the interim drying facility. This location is preferred due to its close proximity to ponds containing the most solids, and includes a significant amount of flat ground. At least three alternative locations for the interim drying bed and permanent enhanced drying facility will be considered, including the existing Pond 13, the flat area immediately north of the treatment ponds system, and the existing dry Ponds 16 and 17 area (see Figure 5-1). The alternatives will be compared and preferred locations selected for both the interim and permanent facility based on technical feasibility, constructability, potential for integrating the interim and final facilities, and compatibility with other treatment system components and operations. The potential to convert the interim facility to a permanent facility will also be considered in the evaluation.

5.2.1.4 Drying Facility Design

Key issues to be addressed during the design of the drying facilities will include:

- Analysis of subgrade conditions, including bearing capacity and potential for total and differential settlement under equipment, system component, and treatment solids loads; and

- Evaluation of the ability to dry the solids given site conditions and the components needed to accomplish drying.

The major components of the drying facilities to be designed include:

- Engineered controls (site grading, ditches, berms) to prevent storm water run-on to the site facilities and manage direct precipitation runoff from the site.

- Provision for managing direct precipitation, high groundwater, and dewatering discharge from the facility. (If Pond 13 is the selected alternative for the enhanced drying facility, a stable permanent breach of the existing Pond 13 embankment will be required to allow gravity drainage to the pond system.)

- A sacrificial trafficking layer, if needed, to facilitate placing and spreading treatment solids in the dewatering/consolidation cells.

- Cell divider/equipment access berms.

- A filter-protected drainage layer, if needed, to promote rapid downward drainage (and resultant dewatering and consolidation) of placed treatment solids.

- Provision for treating drying facility leachate, if necessary, and monitoring the effect of the leachate treatment stream on the pond system at the point of entry.

Design analyses will include bearing capacity utilizing standard foundation engineering calculations and consolidation/settlement utilizing standard calculations, or if necessary depending on the subgrade conditions, the SIGMA/W software by Geo-Slope International. If necessary based on the design analyses (particularly in the case that Pond 13 is the selected alternative), the use of reinforcement-grade geotextile and/or geogrid will be considered to provide an adequately stable subgrade for the facility.

Calculations will be performed to evaluate the potential for downward drainage from the placed treatment solids to the underlying alluvial aquifer. These calculations will be made with standard infiltration/seepage equations, flow nets, or utilizing the SEEP/W software by Geo-Slope International. If a constructed drainage layer is required to promote adequate dewatering and consolidation of the treatment solids, hydraulic calculations based on Darcy's equation will be used to size, slope, and select the appropriate gradation for the drainage layer; collection and conveyance piping will be sized and sloped based on standard pipe flow equations. A filter layer will be designed to protect the drainage layer from clogging by movement of the fine-grained treatment solids into the coarse-grained drainage material. The filter compatibility of the drainage layer with the underlying subgrade will also be checked and the drainage material gradation adjusted or a second filter layer designed if necessary. Filter compatibility and design will be based on the current methodologies practiced by the Natural Resources Conservation Service (NRCS), U.S. Bureau of Reclamation (Bureau), and/or U.S. Army Corps of Engineers (COE).

5.2.1.5 Solids Removal Process

Based on the field investigations and related laboratory testing conducted in 2001-2002 and subsequent observations at the RTOU, the initial solids removal may involve the following sequential steps and methods. (Referenced 2001-2002 study results will be summarized in the Solids Removal Plan.)

1. Divert pond inflow utilizing an appropriate combination of berming, ditching, and piping. (Flow through Pond 18 was diverted in Fall 2010.)

2. Remove the surface water in the pond by siphoning and/or pumping; convey the water removed to the next pond downgradient. (Pond 18 water was pumped down in Fall 2010.)

3. Allow the exposed solids to dewater in place for as long as possible, with the objective of drying sufficiently to remove with earthmoving equipment. (It is expected that Pond 18 solids will be sufficiently dried for removal with earthmoving equipment in the summer of 2011.)

4. Excavate and haul the dewatered solids to the drying facility using conventional earthmoving equipment (e.g., tracked excavators and/or loaders, dump trucks).

5. If groundwater levels are too high to allow adequate drying/consolidation of all the solids in the pond scheduled to be removed, remove the additional solids utilizing appropriate dredging equipment and methods, and convey the dredged material to the drying facility.

6. Interim management of the dried Pond 18 solids may be needed in 2012 to accommodate drying solids from lower ponds if the permanent site repository is not ready to receive the dried solids.

Specific details on the configuration, construction, and use of the interim drying area will be developed in the Solids Removal Plan.

5.2.1.6 Solids Removal Plan Elements

The Solids Removal Plan will be developed based on the available information and the findings of field and technical assessments. The plan will address the following issues, elements, and criteria:

- Results of site investigations;

- Solids volume estimates:

    - Estimated average depth and volume of solids removal (measured as in situ saturated volume in the pond),

    - Minimum and maximum thickness of settled solids to remain in the pond as a low permeability layer in each pond, and

    - Range (minimum and maximum) of anticipated initial removal volume to be accomplished in 2011, and total initial removal volume to be accomplished;

- Priority sequence of solids removal (initially assumed as beginning at Pond 18 in 2011 and progressing to downgradient ponds in 2012-2013);

- Solids management and drying procedures;

- Interim drying area design and backup documentation;
- Estimated volume and characteristics of dewatered (i.e., "dried") material to be removed from the interim on-site drying facility and placed in a permanent on-site repository in 2012-2013;
- Process and schedule for drying bed construction and removal of solids in 2011 and subsequent years; and
- Process and schedule for design and construction of the permanent drying facility.

The Solids Removal Plan will be submitted for review and approval by EPA.

5.2.2 Subtask B2 – Drying Bed Construction, Solids Removal, and Solids Management

Removal activities will commence following approval of the Solids Removal Plan. Removal will proceed according to the Solids Removal Plan. Work will include the following primary construction activities: 1) construction of the interim drying facility; 2) solids removal and transport to the interim drying facility; and 3) management of solids and water in the interim drying facility.

The activities of the selected construction contractor will be overseen by Atlantic Richfield on a full-time, on-site basis. Depending on actual conditions encountered during the course of the work, appropriate adjustments in the sequence and/or the means and methods of removal may be identified. Any such adjustments will be presented to the Agencies for timely review and approval, and upon approval, implemented by the construction contractor.

In addition to observing the quality of the work, Atlantic Richfield oversight will also track and record the depth and volume of solids removed from each pond and the location and time of placement in the interim on-site drying (or combined decant and drying) bed facility. Periodic surveys will be made of the solids deposited in the drying bed to document the amount and rate of ongoing consolidation.

An ongoing assessment will be made of the need to control dust from the interim drying bed facility. The surface of the solids in the drying bed will be treated either with a light water spray or a suitable dust suppressant as necessary.

Design and construction of a permanent drying facility will be performed to facilitate long-term solids management. Siting and design criteria will be similar to those described above for the interim drying facility. Siting will be dependent on other site modifications related to solids disposal, water treatment, and long-term site controls.

5.2.3 Subtask B3 – Pond Stability Analysis and Upgrades

Pond stability will be analyzed by performing a geotechnical evaluation with appropriate subsurface investigation of the pond dike structures and containment effectiveness for those settling ponds needed for future operations. In addition, a hydrological evaluation of the Dolores River channel as it relates to the pond containment structures and the floodplain area around the settling ponds will be conducted and appropriate protection measures will be identified, designed, and constructed. While some portion of this work may be performed as part of construction of the water treatment system described in Section 5.6.3.3, initial assessment of the dike system and some upgrades to the structures may be needed to meet the objectives of the Removal Action. The following tasks will be performed.

- St. Louis Tunnel pond system stability will be analyzed by performing a geotechnical evaluation with appropriate subsurface investigation of the pond dike structures by employing standard engineering stability analyses;

- A hydrological evaluation of the Dolores River channel will be performed as it relates to the pond dike system and the stability and effectiveness of containment structures when exposed to high flow conditions (i.e., the minimum of a 100-year event) using standard channel hydraulics modeling to determine flow and velocity and appropriately size riprap or other erosion protection; and

- Appropriate protection measures will be identified, designed, and constructed.

This work will be conducted with consideration of the requirements of Subtask F3. However, upgrades to the armoring of the dike embankment exposed to the Dolores River prior to or during solids removal phases may be necessary pending completion of the above analyses.

5.3 TASK C – DESIGN AND CONSTRUCTION OF A SOLIDS REPOSITORY

Permanent disposal of settled treatment solids is a key objective of the removal action. On-site disposal of current pond solids and solids generated by future water treatment provides significant advantages compared to off-site disposal, including:

- Consolidation of treatment solids with other existing, related mine wastes at the RTOU. (The existing solids will be identified and characterized and reported to EPA prior to placement.)

- Avoidance of potential public inconvenience, safety issues, and environmental impacts that would or may arise with large-scale, long-term hauling of solids to an off-site facility (especially in the event of accidents or spills).

- Long-term management of disposed solids at a controlled location.

- Minimization of handling and conveyance time (and associated equipment emissions).

- Minimization of cost of permanent disposal of solids.

It is anticipated that the storage facility that is constructed during this action will provide long-term operating capacity for managing water treatment related solids from the Site. Furthermore, it is anticipated that long-term oversight and regulation of this facility will be performed under state and local solid waste permitting and regulatory authority. As such, in addition to meeting applicable substantive technical requirements, the design and construction of this repository will be implemented consistent with administrative requirements under state and county solid waste regulations to the degree possible. However, it is not required that a Certificate of Designation (CD) be obtained under the terms of this Work Plan, and CERCLA response actions will continue at the Site related to existing waste management and not be delayed due to administrative permitting procedures.

Task C includes compilation, review, and evaluation of existing data; alternatives evaluation; and design and construction of the solids repository. Siting of potential supplemental solids repositories will also be performed. Though several repository alternatives will be considered, the preferred alternative will be the dry-stacked repository. The dry-stacked repository design allows for more efficient use of available land and provides a more stable long-term repository than a wet-conventional design.

5.3.1 Subtask C1 – Develop a Repository Design and Operating Plan

5.3.1.1 Compile, Review and Evaluate Existing Data

Available data from previous site investigations and laboratory testing of foundation conditions and potential borrow locations at the RTOU will be compiled, reviewed for relevance to the planned on-site repository, and evaluated to support design of this facility.

5.3.1.2 Repository Siting

Alternative locations for the treatment solids repository will be identified and characterized. Potential site locations identified to date are shown on Figure 5-2. Site characterization will address existing facilities, the presence of historical mining wastes, geology (including groundwater, geologic hazards, subgrade conditions, etc.), hydrology (direct precipitation and storm runoff), and known or potential, current or future, compatible or conflicting land uses. Site selection will be based on anticipated solids properties (especially dry density), operational efficiencies and cost considerations, and if necessary, land use and/or ownership status at the time a final decision must be made. Repository siting will, to the extent practicable, comply with federal, state, andlocal applicable or relevant and appropriate requirements (ARARs).

5.3.1.3 Supplemental Field Investigations and Laboratory Testing

Field investigations will be conducted to confirm previous data and gather additional data as to key physical properties of the repository foundation and potential on-site borrow materials for construction. The field investigations will include test pits/trenches and exploratory borings (or cone penetrometer soundings) within and/or in close proximity to the proposed repository footprint, and test pits/trenches in up to two potential on-site borrow locations. Borings and test pits will be logged and photographed. The final decision as to the number and location of borings, soundings, and test pits will be based on the results of the existing data review and the repository site alternatives evaluation.

Samples from the potential repository and borrow locations will be collected and submitted to a geotechnical laboratory for gradation, Atterberg limits, and moisture/density relationship testing. Shear strength (e.g., consolidated-undrained triaxial testing with pore pressure measurement) and consolidation testing will be performed as needed. Triaxial shear strength and associated consolidation testing will be performed on precipitation solids samples generated by lime addition to St. Louis Tunnel discharge.

If a water treatment system other than or supplemental to lime precipitation is selected for use at the site, then appropriate analysis will be performed on the type of solids generated to assist in repository design and materials handling procedures.

5.3.1.4 Repository Design

A Repository Evaluation and Preliminary Design Report will be provided to EPA and include the data and conclusions for repository site selection, the results of field investigations and laboratory testing, and a preliminary repository design with documentation supporting design criteria. Upon EPA approval of the Repository Evaluation and Preliminary Design Report, the detailed repository design will be completed.

The design of the on-site repository will address the following issues and criteria:

- Provide capacity for 50 to 100 years of solids disposal from rehabilitation of the settling ponds, non-water treatment waste disposal, and future operation of the treatment system (i.e., 50- to 100-year repository design life);

- Provide run-on/runoff erosion protection to accommodate active operations during the pre-closure period and long-term protection during the post-closure period;

- Minimize infiltration and resultant leachate generation;

- Prevent, to the extent practicable, release of untreated leachate;

- Achieve adequate factors of safety (FS) against slope failure under appropriate loading conditions; and

- Achieve adequate factors of safety related to flood events.

As discussed further under Slope Stability below, the ultimate dry density (and associated shear strength) of the treatment solids to be placed in the repository will govern the type of repository (i.e., wet-conventional versus dry-stacked), and if dry-stacked, the stable slope inclination. At this time, it is anticipated that the design will move forward based on a dry-stacked repository concept. The dry-stacked repository design allows for more efficient use of available land and provides a more stable long-term repository than a wet-conventional design but may require additional design features to ensure the waste remains dry. Results from studies performed by Atlantic Richfield will be presented in the design report to support this approach.

Design evaluations/analyses and design features to address these issues and achieve these criteria are described in the following paragraphs.

Capacity Determination. The required capacity of the repository will be established by conservatively estimating the volume of solids to be removed from the upper ponds and the average annual production of treatment solids, and the degree of dewatering and consolidation anticipated prior to placement of the solids in the repository. Initial design will be based on the results of prior field and laboratory testing and proposed additional laboratory testing of representative treatment solids as described above under Supplemental Field Investigations and Laboratory Testing. As discussed under Solids Repository Permitting below, the required capacity of the repository will be further evaluated during the first years of full-scale operation by monitoring of the effectiveness of the proposed means and methods of dewatering and enhanced drying of removed solids.

Given the required design capacity, a final location and preliminary plan layout of the full build-out of the repository will be prepared as part of the design documentation (see below). The layout will then be refined in coordination with the infiltration/leachate control and slope stability design described below.

Run-on/Runoff and Infiltration Control. The Hydrological Evaluation of Landfill Performance (HELP) model will be utilized to evaluate the potential infiltration of direct precipitation (snowmelt and rainfall) and resultant leachate generation within the repository. Infiltration will be minimized to the extent practical by a combination of run-on control utilizing ditches/berms, appropriate sloping of the repository top and side slopes, and placement of interim cover material during operation and permanent cover material upon final filling. Interception ditches/berms will be designed to safely convey run-on from the 25-year, 24-hour storm during the pre-closure period and from the 100-year, 24-hour storm during the post-closure period of the repository, as approved by CDPHE for the existing on-site Soil Lead Repository. Interim (pre-closure) cover material will be designed primarily to control dust generation

from, and erosion of, the placed treatment solids, and secondarily to minimize infiltration to the extent practical consistent with ongoing operations. The permanent (post-closure) cover will be designed to minimize long-term infiltration and support vegetation to provide erosion resistance. Consideration will be given to an internal vertical drain (as utilized successfully at the on-site Soil Lead Repository) to capture and convey incident precipitation on the active top surface of the repository to the ponds treatment system during the active life of the repository.

Leachate Control. A liner and leachate collection system will be designed to intercept precipitation that infiltrates into the repository and pore water released from the placed treatment solids. The intercepted leachate will be conveyed to the ponds treatment system. The preliminary design concept for the liner and leachate collection system is summarized as follows:

- Graded and compacted subgrade;
- Basal cushion layer of appropriately graded sand to fine gravel;
- Geo-membrane liner (e.g., high-density polyethylene [HDPE], polyvinyl chloride [PVC] or similar liner material);
- Drainage layer of graded sand and gravel overlain by a filter layer of graded sand compatible with the overlying treatment solids and underlying drainage material; and
- PVC piping to convey collected leachate by gravity to ponds treatment system.

The minimum hydraulic capacity of the drainage layer and piping will be based on the results of the HELP modeling discussed previously and analysis of the long-term consolidation of the treatment solids in the repository utilizing the SIGMA/W (and if necessary the SEEP/W) software by Geo-Slope International, or equivalent software. The hydraulic design of the drainage system will utilize calculations based on Darcy's equation to size, slope, and select the appropriate gradation for the drainage layer; collection and conveyance piping will be sized and sloped based on standard pipe flow equations.

Slope Stability. As discussed previously, the type of repository (wet-conventional versus dry-stacked) will depend on the dry density (and associated shear strength) of the treatment solids at the time of final placement in the repository. A wet-conventional repository would involve constructing a conventional earthen-diked basin to contain solids that have not been adequately dewatered and consolidated. Based on prior laboratory and pilot-scale field studies, and the currently proposed primary in-pond dewatering and consolidation of treatment solids in a drying facility and subsequent solids management, it is assumed that a dry-stacked repository design will prove feasible. The following discussion is based on this assumption.

The design of a dry-stacked repository will address: 1) the anticipated shear strength of the placed treatment solids; 2) the materials and geometry of the liner system; and 3) the inclination of the exterior slopes of the repository. If necessary to achieve the design factors of safety noted previously, consideration will be given to the use of tensile reinforcement within the placed treatment solids (e.g., geogrid or granular soil layers). The stability of the repository will be evaluated utilizing the SLOPE/W software by Geo-Slope International. Loading cases to be analyzed (and the associated minimum required FS) will include: short-term loading during active operations (pre-closure period) – FSmin = 1.3; long-term loading at full build-out (post-closure period) – FSmin = 1.5; and seismic loading – FSmin = 1.1 (based on an appropriately conservative pseudo-static analysis).

Design Documentation. The design of the treatment solids repository will be documented in an Engineering Design and Operations Report (ED&OR) for submittal to EPA, Dolores County, and CDPHE.

5.3.1.5 Solids Repository Permitting

EPA recognizes that Atlantic Richfield intends to obtain a CD for the Solids Repository, and construction activities for the permanent repository will commence following issuance of the DLUA and CD by Dolores County. EPA is not requiring that a permit be obtained as consistent with CERCLA response actions. However, the schedule associated with this Work Plan is intended to accommodate the permit review and decision process for the repository to be completed before it is necessary to place pond-related solids. If the permitting process is delayed for an extended period, then it may be necessary to re-evaluate this condition.

A CD application will be made for construction of the repository subgrade, liner/leachate collection system, and placement of the existing precipitation solids removed from the upper ponds (and temporarily staged in the interim drying facility). The ED&OR will also address post-removal action of new treatment solids in the permanent drying facility and then into the solids repository following adequate dewatering and consolidation. The ED&OR accompanying the application will describe potential alternative placement methods, slope configurations, and stabilizing elements (e.g., external slope buttress; internal tensile reinforcement; etc.) that may be implemented pending the testing and evaluation of dewatered and consolidated treatment solids during the first several years of full-scale operation of the ponds treatment system and permanent drying facility. An amendment will be prepared and submitted to Dolores County and CDPHE describing the final selected repository slope configuration and stabilizing elements (if any) prior to placement of newly generated treatment solids.

5.3.2 Subtask C2 – Solids Repository Construction and Initial Solids Placement

Construction will proceed in the sequence and utilizing approved means and methods as identified in the ED&OR, construction drawings, and technical specifications. The work will include the following primary construction activities: 1) construction of the subgrade improvements, run-on controls, liner system, and initial berm/buttress constituting the primary solids repository; 2) construction of the permanent drying facility (described in Section 5.2); and 3) placement of solids from the interim drying facility into the prepared repository, including external buttressing and/or internal reinforcing elements if/as needed.

The activities of the selected construction contractor will be overseen by Atlantic Richfield on a full-time, on-site basis. Depending on actual conditions encountered during the course of the work, appropriate adjustments in the means and methods of construction and/or initial placement of solids may be identified. Any such adjustments will be presented to the Agencies for timely review and approval, and upon approval, implemented by the construction contractor.

In addition to observing the quality of the work, Atlantic Richfield oversight will also track and record the depth and volume of solids removed from the interim drying facility and the location and time of placement in the solids repository. Periodic surveys will be made of the solids deposited in the repository to document the amount and rate of ongoing consolidation.

An ongoing assessment will be made of the need to control dust from the repository. If necessary, the surface of the repository will be treated with a light water spray, a suitable dust suppressant, or if appropriate and otherwise necessary, with a reinforcing element.

5.4 TASK D – HYDRAULIC CONTROL MEASURES FOR THE COLLAPSED AREA OF ST. LOUIS TUNNEL ADIT

A portion of the St. Louis Tunnel immediately behind the existing masonry block portal structure has collapsed, apparently due to borrowing of the overlying colluvium/talus deposits. The current condition is a tangle of broken timbers and lagging among a heterogeneous mix of sand to boulder size blocks resulting in unstable voids of varying size and shape. The discharge from the tunnel is impeded at the east (upgradient) end of the collapse such that flow is observed at approximately the former tunnel roof level. This flow then falls and works its way through the collapse to exit at the original tunnel floor grade in the still standing portal structure. As a result of this condition, there may be an accumulation of debris or precipitated solids near the adit opening.

The purpose of this task is to provide engineered controls for the release of the mine water and impounded metals precipitate from behind the collapsed St. Louis Tunnel adit. The task will be accomplished by analyzing existing mine maps and other data regarding the mine and geology, investigating the collapsed portion of the adit behind the St. Louis Tunnel portal, developing preliminary conceptual engineering alternatives, developing designs for engineered hydraulic controls, and construction of the hydraulic control features.

Analysis of existing mine geology and mine plans and workings and development of control strategies will be performed by qualified professionals with experience in underground mine investigation and remediation. The evaluation by these individuals will include the following tasks and reporting.

5.4.1 Subtask D1 – Adit Collapse Area Investigations

The primary objectives of the investigation of the collapsed portion of the St. Louis Tunnel adit immediately above the portal structure are to: 1) assess the possible accumulation of settled solids and mine water build-up behind the existing debris blockage in the collapsed area; and 2) provide information to support design of an appropriate hydraulic control system(s) such as a pressure bulkhead with valve-controlled piping for the discharge. Additional borings outside the immediate area of the collapse and other approaches to investigate the adit condition are described below.

Compile, Review and Evaluate Existing Data. Existing information on the grade and alignment of the St. Louis Tunnel (from existing mine plans) and on the geology of the portal area from previous site exploration and additional exploration will be compiled, reviewed, and evaluated to support the investigations under this task and the preliminary design of hydraulic controls.

Detailed Survey and Site Reconnaissance. A detailed topographic survey of the collapsed area will be conducted and a map prepared at a contour interval of 1 foot or less. The survey will be performed using conventional (total station or survey-grade Global Positioning System [GPS]) techniques unless it is determined that direct access onto the collapsed rubble is not safe. In that event, the feasibility of access utilizing a mobile telescopic or articulated man-lift will be evaluated. Given the existing topography at the RTOU, it appears that this approach would be limited to the downgradient end of the collapse without grading an access platform between the toe of the Soil Lead Repository and the collapsed area. If conventional surveying proves infeasible, then ground-based Lidar will be used. Set-up locations for the Lidar equipment appear feasible on the Soil Lead Repository.

In addition to surveying the surface of the rubble, detailed panoramic digital photographs will be taken and video recorded with recognizable temporary benchmarks visible for which coordinates and elevation are known. The presence, location (with coordinates and elevation to the extent feasible), character (color,

presence of suspended solids or turbidity), and estimated flow rate of any visible flow or seepage within the collapse area will be recorded to the extent safe and feasible.

Assessment Options. A written plan shall be developed and submitted to EPA detailing the adit investigation approach addressing the full scope of this task as described in this Work Plan. The feasibility of drilling a boring(s) to intersect the St. Louis Tunnel just upgradient of the collapsed portion of the tunnel above the portal will be evaluated. A platform for the drilling rig would be constructed by grading either on the slope just south of the collapsed area or on the adjacent Soil Lead Repository to the north. The objective of the boring(s) is to confirm the extent of the collapse and observe if precipitated solids are encountered within the tunnel, either by discharges from the tunnel in the drill pipe, or by camera survey if no discharges occur. Drill pipe diameter will be selected in coordination with identification of a suitable pipe inspection camera system. Pipe diameter as small as 2 inches is feasible with a push system, but deployment length is typically limited to 200 to 300 feet. A crawler system typically requires at least a 4-inch pipe diameter, but length is not a limiting factor in this application. Coring will be performed where possible to collect samples of competent rock for geotechnical assessment.

If drilling an exploratory boring is determined not feasible, or if conditions in the tunnel remain uncertain even with an exploratory boring, then an approach of staged, protected excavation of the collapsed portion of the adit or development of alternate access to the adit will be developed.

It is anticipated that it will be necessary either to remove the blockage at the portal or to create an alternate access to direct mine water to bypass the existing portal collapse and allow entry into the St. Louis Tunnel adit. A determination will be made during the adit portal investigation of the most effective method to reopen and install structural support to the adit inbound to enable direct physical inspection and sampling for the purpose of placing an effective hydraulic control structure. This evaluation will be performed by qualified individuals with underground, hardrock mining experience. If this option is determined appropriate, then a qualified mining firm will be employed to perform the necessary work to re-establish a safe entry structure into the adit. Precautions to manage surge water and associated solids behind the collapse, such as containment and settling, and other treatment as necessary, will be in place prior to draining or opening the adit.

Adit and Portal Investigation Report. An Adit and Portal Investigation Report summarizing the findings of the investigation will be completed and submitted to EPA. The Adit and Portal Investigation Report will include the topographic map, photographs, and a log of the exploratory boring (if drilled). If a camera survey is performed, a video and extracted photographs will also be provided.

5.4.2 Subtask D2 – Preliminary Design of Hydraulic Controls of the Adit Discharge

The primary objectives for hydraulic controls of the adit discharge are to: 1) to the extent practicable, gather and convey all of the tunnel discharge to the water treatment system in a controlled manner; and 2) mitigate the risk of release of settled solids and debris that may have accumulated in the St. Louis Tunnel behind the blockage in the collapsed adit area.

This task will involve developing and evaluating hydraulic control concepts and then carrying the selected concepts forward to the 30 percent design level. Following approval of the 30 percent design, a final design will be developed and submitted to EPA.

Develop Hydraulic Control Concepts. Based on existing information and preliminary consideration of this issue, the following concepts will be further characterized and evaluated to meet the objectives noted above. Additional control measures will be considered as needed to meet the objectives of this task.

- Local excavation of collapsed debris immediately upgradient of the existing masonry block portal structure; grading and local lining of a collection basin for tunnel discharges to capture and direct flows through the existing portal structure; upgrading of conveyance through the structure if necessary; and integration with the inlet channel downgradient of the portal structure and to the upgraded ponds treatment system.

- Depending on the results of the investigative boring described above, enlarge the pilot bore (likely requiring drilling a new bore) and install a permanent pipe drain sized to prevent build-up of head within the lower St. Louis Tunnel/CHC Hill; construct the pipe with a vertical riser as the pressure control measure, and provide means to convey any flows/solids discharging from the drain pipe to the ponds system for treatment.

- Evaluate the need and practicality of constructing a surge basin within the collapse area as a back-up to detain flows and drop out solids, should a release of materials accumulated behind the collapsed portion of the adit occur; this would involve constructing a lined earthen dike at the upgradient end of the catchment basin noted above, with a lined spillway section to convey flows over the dike and into the basin in a controlled manner.

- An evaluation of the conditions at the portal and the investigation information in relation to the objectives described in the Work Plan will be performed to determine if removing all of the rock and debris within the full 200-foot long collapsed area upgradient of the proposed collection basin is necessary. Consideration will be given to the potential benefit the debris may provide as erosion protection, safety, the engineering feasibility of working with the existing collapse and still collecting the discharge and preventing conditions that may lead to future "blowouts" near the portal area. In addition, the investigation of the workings and areas of influent water will be factored into this decision. EPA will make a determination based on this evaluation as to whether the debris will need to be removed.

Develop Preliminary (30 percent) Design of Adit Hydraulic Controls. The selected adit area hydraulic control concepts will be designed to the 30 percent level based on the results of the investigations. The objective of the 30 percent design is to confirm the technical feasibility of the selected concepts in terms of: 1) constructability given site physical and environmental (weather) conditions; 2) location of major components and their relationship to other project facilities and existing infrastructure at the RTOU; and 3) key materials required for construction. The 30 percent design will include the evaluations and analyses and work products described in the following paragraphs.

Evaluations and Analyses. Previous evaluations of the anticipated range of discharge flows from the St. Louis Tunnel will be reviewed and revised or updated as necessary. These evaluations will utilize the existing predictive model developed from historic tunnel discharge, ponds system discharge, and Dolores River flow measurements. The predicted range of flows and any new information collected under this Work Plan will be utilized as input in sizing and designing the collection system. Collection basin capacity and conveyance will be analyzed utilizing standard hydraulic equations and/or simplified routing models.

If necessary based on the results of the investigations described above and review of relevant literature (to the extent available), an assessment will be made of the potential rate and volume of a release of settled solids from the tunnel at the upgradient end of the collapsed area above the portal structure. The estimate of release rate and volume would be used to size and design the catchment dike.

Work Products. The Preliminary (30 percent) Design Report will be submitted as a Technical Memorandum to EPA for review and approval and include the following information and work products:

- Narrative discussion of site investigations, concept development, 30 percent design level evaluations and analyses, and intended operations (both normal and emergency conditions);

- Description of key work items and components to construct the hydraulic controls, including component sizes (key dimensions), capacities, and materials; and

- Layout drawings of hydraulic controls, including plan, sections, and preliminary details.

5.4.3 Subtask D3 – Final Design and Construction of Adit Hydraulic Controls

Upon EPA approval of the Preliminary (30 percent) Design Report, the detailed design for hydraulic controls will be completed and submitted to EPA for approval. The final design will include the following information and work products:

- Narrative discussion of site investigations, concept development, final design level evaluations and analyses, and intended operations (both normal and emergency conditions);

- Description of key work items and components to construct the hydraulic controls, including component sizes (key dimensions), capacities, and materials;

- Scaled layout drawings of hydraulic controls, including plan, sections, and final details; and

- Engineering Specifications and QA/QC Requirements provided as an attachment or addendum to the Final Design.

The hydraulic controls will be constructed in accordance with the final design.

5.5 TASK E – SOURCE WATER INVESTIGATIONS AND CONTROLS

Flows from the St. Louis Tunnel are high and vary significantly by season, requiring a large design capacity for a water treatment system, high neutralization materials requirements, and handling and disposal of a large quantity of waste solids. Depending on the nature of the adit and mine workings, it may be possible to reduce outflows from the St. Louis Tunnel, and thus reduce the loading of contaminants to the Dolores River. It also may be possible to manage water within the mine to attenuate seasonal or storm surge flows through the water treatment system, thus reducing water treatment design capacity. In the long term, reducing flow from the St. Louis Tunnel could be cost-effective as it could result in reduction in the overall water treatment design capacity, peak water treatment capacity, and solids handling and disposal requirements.

The purpose of this task is to identify sources of water entering the mine workings that have the potential for being reduced or eliminated from contributing to the discharge at the St. Louis Tunnel and associated mine openings, and implement actions that are expected to significantly reduce flows and/or contamination of water flowing through the mine. The task includes review of existing data and evaluation of the data including geology, hydrogeology, mine workings, geologic structures, and other relevant features. Findings and recommendations for additional investigations will be submitted to EPA in a Technical Memorandum. Investigations will be conducted to confirm the findings of the data review, determine locations where significant flows of influent waters may be eliminated or reduced such that flows contributing to the metals load in the adit are reduced, and determine if it is feasible to install flow control structures. If it is determined that flow into the mine can be effectively reduced, then preliminary design concepts for source water control structures will be prepared and submitted to EPA for approval. If

it is determined that cost-effective options are available, then final designs will be completed and the control structures will be constructed in accordance with the approved designs.

Analysis of existing mine geology and mine plans and workings and development of control strategies will be performed by qualified professionals with experience in underground mine investigation and remediation. The evaluation by these individuals will include the following tasks and reporting.

5.5.1 Subtask E1 – Review Existing Data

Existing mine maps, mine water pool information, hydrogeology information, and other information related to the mine workings and flow of water into and through the mine will be reviewed to assist in identifying potential means for reducing the flow and/or contamination of water in the mine. Potential access points to underground workings will be identified. Appropriate areas to target for further investigation will be identified, and additional subsurface investigations will be proposed.

5.5.2 Subtask E2 – Additional Investigations

Priority will be placed on identifying possible sources of water entering the mine from the surface or near surface. A plan will be developed and submitted to EPA before this task begins defining the approach and scope of this investigation following review of the existing data.

Identifying and confirming the sources of water entering the mine workings may require entry into the workings or other subsurface investigations. Other methods of subsurface investigation and hydrologic evaluation of mine waters will also be employed to assess the mine water sources and flows.

A determination of the appropriate areas to target inspection and the appropriate subsurface investigation methods will be based on the analysis described above.

5.5.3 Subtask E3 – Evaluation of Hydraulic Controls Alternatives

Means of reducing influent water to the mine or isolating water entering the workings may include controls to limit surface water from entering into underground mine features, grouting of faults/fracture systems, or an engineered bulkhead. Following the findings of the above investigations, an analysis of feasible options to reduce flow from the St. Louis Tunnel will be performed and the findings presented to EPA in a Technical Memorandum.

5.5.4 Subtask E4 – Mine Water Source Controls – Design and Construction

If cost-effective alternatives for mine water source controls are identified, then preliminary designs for proposed hydraulic controls will be provided to EPA, and final designs will be prepared upon approval of the preliminary designs. The final design will include the following information and work products:

- Narrative discussion of site investigations, concept development, and final design level evaluations and analyses;
- Description of key work items and components to construct the hydraulic controls, including component sizes (key dimensions), locations, and materials;
- Scaled layout drawings of hydraulic controls, including plan, sections, and final details; and

- Engineering Specifications and QA/QC Requirements provided as an attachment or addendum to the Final Design.

The hydraulic controls will be implemented by qualified personnel in accordance with the final design.

5.6 TASK F – WATER TREATMENT SYSTEM ANALYSIS AND DESIGN

The objective of this task in conjunction with the above tasks is to provide a water management system that provides a sustainable approach to managing the St. Louis Tunnel discharge that is protective of the Dolores River and complies with the associated ARARs. This Work Plan is written with the understanding that Atlantic Richfield has proposed to construct and operate a lime addition treatment system and is seeking a state-issued discharge permit.

This task includes the following subtasks:

- Perform a water treatment technology screening and compare alternatives against the previous method of lime treatment with settling ponds. Submit a Water Treatment Technology Screening Report to EPA.

- Evaluate and present historical data and current data related to the St. Louis Tunnel discharge water chemistry and flow necessary for water treatment technology system screening, design, and operations.

- Submit conceptual design(s) for water treatment and a plan for design investigations. Upon approval of the conceptual designs, perform investigations required for effective system design and operation.

- Conduct design analysis and submit a 30 percent design to EPA for approval.

- Upon EPA approval of the 30 percent design, the final water treatment system design will be completed and the water treatment system will be constructed. An Operation and Maintenance Plan (O&M Plan) will be submitted to EPA for approval, and the water treatment system will be operated and maintained in accordance with the O&M Plan.

The purpose of screening water treatment alternatives is to determine if there is a method to achieve the goals of the Removal Action more reliably, effectively, and/or cost-efficiently than the proposed lime treatment system. Any available information about the previous system should be considered in order to modify the system accordingly to improve performance. The area available for on-site solids disposal is limited, so identification of a method that reduces solids generation may provide long-term cost savings and environmental benefits.

Water treatment system analysis and design for the site may be influenced by modifications to the mine water source controls and the limited area available for long-term solids disposal. The volume and quality of water that requires treatment may be impacted by hydraulic controls that may be constructed as part of Task D. If a substantial reduction in the St. Louis Tunnel discharge flow is achievable, then EPA may allow time to monitor the impacts of any hydraulic modifications before requiring the final water treatment system design and construction. Because water treatment is likely needed even after implementation of hydraulic controls, the investigations to determine a treatment method and conceptual design, and design studies to support ultimate system design will continue as scheduled.

5.6.1 Subtask F1 – Preliminary Water Treatment Alternatives Screening Report

Water treatment technologies applicable to treating mine discharge water will be evaluated and compared to the proposed lime treatment system based on the efficiency of metals removal, metals recovery potential, construction and operating cost, solids disposal requirements, long-term performance, and other factors necessary for comparing and selecting the technology most likely to facilitate treatment of the discharge to the satisfaction of all parties and meet regulatory obligations. At a minimum, the currently proposed lime treatment system, an enhanced lime treatment system such as rotary lime delivery system or high density sludge, and a chemical/biological reactor system will be evaluated in light of conditions at the St. Louis Tunnel.

Alternatives for treating specific source waters such as a small passive chemical/bioreactor to treat leachate from the drying facility or repository should also be considered.

A Water Treatment Technology Screening Report will be submitted to EPA.

5.6.2 Subtask F2 – Treatment System Conceptual Designs and Additional Investigations

A conceptual design(s) for the proposed treatment system(s) will be developed and submitted to EPA. Design studies will be performed as needed to compare alternatives and support water treatment system designs. Investigations may include bench-scale or pilot-scale treatability studies, geologic/geotechnical and groundwater investigations, hydrologic analysis, pond stability analysis, and solids handling, dewatering, and disposal studies. Additional design studies may be required and will be conducted as needed. A plan for the proposed design studies will be submitted to EPA prior to initiation of work.

5.6.3 Subtask F3 – 30 Percent Design

The objectives of the 30 percent design of the water treatment system are to: 1) provide design criteria that allow the system to meet the overall objective stated in Section 1.0 for this Removal Action; and 2) describe the water treatment system and its components to a 30 percent level, as further described in this section.

Development of a 30 percent design for the water treatment system will involve: a) comprehensive review and evaluation of relevant prior studies and data; b) establishing the design criteria for the system; c) identifying and describing the system components and operations; and d) preparing 30 percent design documents.

Existing information, studies, and conceptual designs relevant to development of a water treatment system to the 30 percent design level will be compiled, reviewed, and evaluated. This will include applicable information from the studies described in Section 4.0, from design and long-term operation of other open pond, lime addition mine water treatment systems including the Warm Springs Ponds and Lower Area One systems designed and operated by Atlantic Richfield in Montana and the Leviathan system operated by Atlantic Richfield in California; and from the additional investigations performed for Subtask F2.

5.6.3.1 Preliminary Design Criteria

The design criteria for the water treatment system include but are not limited to the following.

Influent and Discharge Water Quality. The 30 percent design of the water treatment system will be based on the preliminary effluent limits derived from the CDPHE, 2008 Water Quality Assessment

(WQA) for the St. Louis Tunnel discharge and any updates provided by the state. The WQA is expected to form the basis for development of a CDPS permit for ponds system discharges to the river, and a state-issued permit is anticipated at the completion of this Work Plan.

If mine modifications are proposed as part of Tasks D and E, the influent water quality may change. Water quality changes that may affect system design will be identified and considered in the final designs.

System Hydraulic Capacity. The water treatment system will be designed to treat water discharged from the St. Louis Tunnel at the range of flows and conditions anticipated based on existing data over the design life of the system (50 to 100 years). If source control measures are implemented as part of Tasks D and E, system capacity may be modified based on post-construction conditions and predicted flow analysis. Otherwise, the following approach may be taken.

The normal operating flows adopted for 30 percent design will be based on the monthly design discharge capacities established in the WQA, plus 0.6 cubic foot per second (cfs) to account for currently estimated evaporation and seepage losses from the ponds system. These flows will be reviewed and appropriate adjustments made based on refinement of the tunnel discharge predictive model, new flow data gathered as part of Task A, and refined evaporation and seepage estimates. The maximum instantaneous flow to be accommodated in the 30 percent design will be based on the estimated maximum discharge appropriate to the project design life as derived from the predictive model; at a minimum, the design will accommodate the historic maximum recorded tunnel discharge of 2,200 gallons per minute (gpm).

The monthly tunnel discharges to be used for design as described above reflect the fact that water discharged from the St. Louis Tunnel is a result of precipitation (primarily snowmelt) followed by infiltration to the connected mine workings. The rate of discharge from the tunnel generally parallels the flow rate in the Dolores River; that is, as a rule, when the tunnel discharge is high, so is the Dolores River flow, and when the tunnel discharge is low, the river flow is also low, with the tunnel flow extremes dampened and slightly lagging when compared to the river.

Ponds Integrity. The existing embankments will be rehabilitated as necessary to meet operational needs and dam safety requirements. The key design criteria will include industry standard and/or state dam safety mandated FS against slope failure under applicable loadings (long-term static/steady seepage, short-term/construction phase, and earthquake), and protection against internal erosion (piping) of embankment material due to seepage flows. As part of demonstrating pond embankments meet appropriate integrity standards, the hydraulic structures will also be evaluated. The key evaluation and design criteria for the hydraulic structures will be industry standard and/or state dam safety mandated storm water (i.e., "flood") flows, and protection (to the degree practical) of normal flow outlet piping against blockage by beavers.

Operability. Because of the remote nature of the RTOU, the treatment system should be designed to be simple, reliable, and easy to operate with minimal on-site operations personnel. Other consistent operability goals include low maintenance, infrequent solids handling, and remote monitoring, operation, and control. The system will be designed to prevent solids fouling that could impact effective water treatment operations.

These operational criteria are required to accommodate the following conditions: 1) the RTOU is located in a remote region of the San Juan Mountains near the Town of Rico, which has a population estimated to range from 200 during the winter to 500 in the summer; 2) the nearest urban center with significant population is Cortez, which has a population of approximately 8,300 and is 45 miles (over 1 hour travel time during good weather) from Rico; and 3) the RTOU is at an elevation of approximately 8,800 feet and

during the winter is frequently accessible only by snowmobile or by foot (unless a more permanent and consistent snow plowing effort is undertaken).

5.6.3.2 Treatment System Components and Operations

This section presents information developed by Atlantic Richfield for a lime addition-based water treatment system and is presented in this Work Plan assuming that system is implemented. The following components would be included in a lime addition system design.

Flow-Based Lime Addition Control. The range of pH required for optimal operation based on studies to date is between 8.5 and 9.5, with an initial treatment target pH of 9.0. A dosage control concept will be evaluated and characterized to determine if it will facilitate a stable treatment target pH. The flow rate of the collected tunnel discharge would be measured ahead of pH adjustment at the new lime addition facility to enable automatic pacing of lime feed based on incoming flow. The flow and quality of water that flows into the system in downstream ponds, such as leachate from drying operations or the repository, will be considered in the lime dosing calculations.

Lime Storage System. Lime storage capacity will be evaluated during 30 percent design to establish practical sizing. Factors to be considered will include frequency of shipments and reasonable storage life. If practical (with consideration of storage life), lime storage will be based on providing sufficient capacity to continue treatment without additional lime shipments using the maximum expected dosage and during a 30 to 60 day period of peak discharge (late spring/early summer) and/or throughout the winter (when typically lower dosage rates are anticipated). The existing lime silo will be evaluated in terms of its ability to meet the needs of the newly designed system; the silo would be upgraded or replaced to meet the new design requirements. The feasibility of equipping and reusing the existing lime feed building will also be evaluated relative to its condition, size, and suitability. Improvements to the existing access road into the RTOU will also be designed to enable delivery of lime with a suitable turn-around loop near the lime silo.

New Lime Addition Facility. A new hydrated lime facility (as opposed to the original slaked lime system) will be designed to add lime to the tunnel discharge upstream of the first (primary) settling pond. The current concept to be reviewed and refined is for lime to be added continuously and at a rate proportional to incoming flow at a capacity capable of attaining a pH of 9 to 9.5 ahead of the first treatment pond.

Lime Addition Capacity. Lime requirements will primarily be based on bench-scale testing completed to date (and possibly additional verification testing) on tunnel effluent. If water from the drying operations and/or repository will flow into the ponds, the lime requirement for these waters will also be considered. Maximum feed rates will be based on providing lime dosage required to obtain a pH of 9.5 on tunnel discharge and other source waters unless an alternate target is identified during the course of the 30 percent design effort. Use of commercial (versus laboratory) grade lime will be evaluated in terms of materials properties and utilization efficiency versus cost. Maximum lime feed capacity will be based on the design maximum peak discharge from the tunnel determined and assuming dosage rates based on adjusting influent from the tunnel to the target pH range.

Solids Precipitation in Ponds. Due to site constraints, including steep topography and limited open area, the efficient use of available space is desirable. This includes optimizing use of available in-pond solids settling area and volume. Based on studies to date, it appears that only a few ponds will be required to provide reliable solids settling for treatment purposes. Two pond configuration alternatives will be considered for the primary solids precipitation: 1) existing configuration with Pond 18, then Pond 15 as primary settling ponds; and 2) Pond 18 and a new pond to be constructed in the currently off-line, largely filled Ponds 16 and 17 as the primary settling pond (as discussed further below). The design will provide

for settling of at least 90 to 95 percent of the solids in the primary settling pond(s), with the remainder of the ponds providing backup settling or "polishing" of the effluent. The potential for immediate settling of solids after lime addition will be considered in the evaluation and design of the location of lime addition relative to the first (primary) settling pond. Means to ensure settling in the ponds to prevent overflow and dissolution of contaminants from the precipitate in lower ponds will be addressed in the design analysis.

Flow Sequence. Alternatives for the primary settling pond and the sequence of flow through the remaining ponds to the point of discharge to the Dolores River will be evaluated in terms of: 1) constructability; 2) detention time; 3) maintaining gravity flow throughout the system; and 4) compatibility and coordination with other project facilities and operations (especially on-site enhanced drying and disposal of settled solids).

Two design alternatives will be further considered. As shown on Figure 5-4, Alternative 1 would utilize the existing Pond 18 as the primary settling/initial consolidation basin receiving lime-amended inflows from the St. Louis Tunnel. Ponds 16 and 17 would not be constructed under Alternative 1, and would thus be available for use as the permanent drying facility site. This alternative would have the same flow path as Alternative 1 downgradient of Pond 18.

As shown on Figure 5-5, Alternative 2 will add a newly reconstructed Pond 16 and 17 ahead of the existing Pond 18. From Pond 16/17, flow will be routed through Pond 18, followed by Ponds 15, 14, 12, 11, 9, 10, 8, 7, 6, and 5 before discharge to the river. This area lies directly east of the existing settling Ponds 15 and 18. It has the advantage of being close to the existing ponds and the potential permanent drying facility in Pond 13 (if selected). The bottom of the pond would be located above surrounding high groundwater levels facilitating gravity drainage during periods of in-pond initial dewatering and consolidation.

Polishing Treatment. The lower ponds (below Pond 11) in the existing system are generally free of accumulated solids and have developed wetlands which may help improve treated discharge water quality. Unless a reason arises during the 30 percent design process indicating otherwise, these existing ponds would be maintained on the hydraulic flow path for passive treatment and provide a buffer against upset conditions in the upper ponds.

5.6.3.3 Planned Pond Upgrades

Utilize Existing System to the Maximum Degree Practical. Both pond configuration Alternatives 1 and 2 include retention of the majority of the existing ponds and embankments, and reinforcement and/or upgrading of embankments, if necessary, to ensure stability. Existing hydraulic structures will be evaluated to determine if they need altering or replacing. Finally, providing bypass piping around certain ponds or groups of ponds will be evaluated. Pond configuration Alternative 2 would also include adding a new primary treatment pond upstream of Pond 18 in the vicinity of historic Ponds 16 and 17. Currently off-line Pond 10 could also be brought on-line to add additional detention/polishing for either Alternative 1 or 2.

Pond Embankments. The existing embankments will be retained to the maximum degree technically feasible and rehabilitated as necessary to meet operational needs, dam safety requirements, and current standards of practice. At present, it is envisioned that any necessary upgrades would be constructed on the downstream slopes and at the downstream toes of existing embankments. Typical measures would likely include: stripping and compacting the existing slope and toe area; placing a filter blanket and if necessary an overlying drainage blanket on the prepared stripped surface; and placing fill as necessary to protect the filter/drain zones and to meet required factors of safety against downstream slope failure under

appropriate loading conditions. Where appropriate, drainage relief and/or piping protection will be provided in the downstream toe foundations.

Pond 16/17 Embankment. Under pond configuration Alternative 1, the Ponds 16 and 17 area will be used for the permanent solids drying facility. Under pond configuration Alternative 2, a new embankment would be constructed around the current Ponds 16 and 17 to create a new primary settling pond. Foundation improvements would be designed and constructed if/as necessary (e.g., removing locally unsuitable material; providing for pore pressure relief and/or piping protection). The embankment would be constructed using standard design measures and construction methods appropriate to the borrow materials available to provide for slope and foundation stability, seepage control, and protection against internal erosion (piping).

Hydraulic Structures. New outlet structures and overflow spillways will be considered in each of the major ponds (Ponds 11, 15, 16, 17 and 18), and Pond 10 if added to the flow path. Outlet structures will be provided with adjustable overflow weirs to regulate pond level. An emergency overflow spillway (independent of the outlet structure) will also be provided to handle excess flows or in the event that the normal outlet structure should become plugged. Bypass piping will be provided on certain ponds to enable bypassing of the subsequent downstream pond. Structures will be designed if necessary to meet operational needs, and for those ponds under State Engineer's Office (SEO) jurisdiction, in accordance with applicable dam safety rules and regulations.

5.6.3.4 Solids Removal

After initial solids removal from the ponds, solids removal will be performed as needed to allow ongoing effective treatment and maintain an adequate detention time. The following solids consolidation method is proposed by Atlantic Richfield to reduce the frequency of solids removal from each pond. The effectiveness of solids consolidation will be analyzed during the design studies and/or the initial cycling process.

Periodically (on the order of once every 2 to 3 years) solids will be consolidated in-place within the uppermost (primary) settling pond to reduce the solids volume and restore a portion of the settling volume and detention time. During the period when solids are being consolidated (estimated to require approximately 1 to 2 months), the flow from the primary settling pond will be diverted to the second pond in series, which will provide primary settling during the consolidation phase. Surface water will be decanted from the uppermost pond to the second pond in series. Ongoing seepage and evaporation in the absence of tunnel water influent to the off-line settling pond will allow the consolidated solids to dewater. Prior bench scale and field testing to date indicates that consolidation in this manner should reduce the settled solids volume to approximately 50 percent of its initial volume (thereby doubling the density of the settled solids to approximately 20 percent solids by weight). Over time (approximately every two to three in-pond consolidation cycles, or on the order of every 4 to 9 years) the volume available for settling post-consolidation will decrease. When this occurs, the consolidated solids will be removed from the primary settling pond to fully restore its initial settling volume and detention time. The initially dewatered and consolidated solids would then be removed and placed in the permanent drying facility prior to disposal in the on-site repository.

5.6.3.5 Automated Monitoring System

An evaluation of the technical feasibility, advantages, and potential operational or maintenance issues of automated monitoring and recording of key treatment process parameters will be conducted. Based on studies to date, the following parameters would be included in the evaluation:

- Flow and pH of tunnel discharge,
- Flow from the final outfall into the Dolores River,
- pH of effluent from the uppermost primary settling pond and the ponds system effluent to the Dolores River, and
- Lime feed rate.

A control system will be developed for automatic flow proportional lime slurry feed based on the flow discharge from the St. Louis Tunnel, and an operator dosage selection.

Remote access to the monitoring data and lime feed control system will also be evaluated. Specific equipment types, methods, and other details of remote monitoring and lime feed operation will be evaluated in terms of need, technical feasibility, reliability and cost.

5.6.3.6 Prepare and Submit 30 Percent Design Documents

The 30 percent design of the water treatment system will be prepared and submitted to EPA for comment and approval. The design report will be comprised of a summary narrative describing the studies and results from the preceding subtasks, and the following work products: 1) comprehensive process flow diagrams; 2) a piping and instrumentation control diagram; 3) plan layout drawings of key facilities/features including other site facilities (e.g., roads, drying facility, repository); and 4) preliminary equipment specifications. The studies will be provided as attachments if they have not been provided to EPA prior to submission of the 30 percent design report. Each of these work products is described in the following paragraphs.

Process Flow Diagrams. The process flow diagrams will illustrate and characterize the key components in the flow path from the tunnel discharge, through the ponds treatment system, ending at the discharge into the Dolores River. Components to be included will include:

- Portal collection facility,
- Conveyance to primary settling pond,
- Inflow measurement structure,
- Lime feeder and storage silo(s), and
- Primary and supplemental settling ponds.

Flow paths for normal operation and operations during periodic solids removal will be shown on separate diagrams. The design range of flow rates, lime feed rates, and pond volumes, detention times, and solids capacities will be shown on the process flow diagrams and/or provided in accompanying tables.

A preliminary material balance will be included as a part of the process flow diagrams. This balance will identify design and normal flow rates for relevant water and treatment solids streams. The material balance will also list projected treatment efficiencies associated with the water treatment system.

The process flow diagrams will also show conceptual layouts for key piping and major equipment (i.e., pumps, mixers, vessels, etc.), and illustrate local and remote monitoring and control instrumentation and associated operational concepts for the water treatment system.

Plan Layout Drawings. Plan drawings illustrating the location and interrelationship of the treatment system facilities/structures will be prepared on the existing 2-foot contour topographic base map for the RTOU, with and without the latest available aerial photography for reference as appropriate. If necessary, notations will be made to indicate where topography has changed since preparation of the currently available mapping. In addition to the facilities listed above under Process Flow Diagram, the drawings will show the conceptual layout of: 1) access road(s), turnaround, and parking areas for the lime storage and lime feed facilities; 2) process-related buried piping alignments; and 3) existing and/or relocated utility lines (electrical power, telephone). The location and characteristics of structural and hydraulic upgrades to the existing ponds and pond embankments will be shown in plan and section views, and key typical details will be included.

5.6.4 Subtask F4 – Final Design and Construction of the Water Treatment Facility

Final design documents will be prepared and submitted to EPA for approval. The final design will include the following information and work products:

- Narrative discussion of site investigations, concept development, final design level evaluations and analyses, and intended operations (both normal and emergency conditions);
- Description of key work items and components to construct the water treatment system, including component sizes (key dimensions), capacities, and materials;
- Scaled layout drawings, including plan, sections, and final details; and
- Engineering Specifications and QA/QC Requirements provided as an attachment or addendum to the Final Design.

The water treatment facility will be constructed in accordance with the final designs.

6.0 LAND OWNERSHIP AND SITE ACCESS

Performance of the tasks specified in this Work Plan will not require that Atlantic Richfield obtain additional access rights or agreements. The water treatment system will eventually be constructed and operated on parcels of land that currently include a mix of privately owned patented lode and placer claims, and U.S. Forest Service-managed National Forest System lands located within San Juan National Forest. As design and construction phases proceed, Atlantic Richfield will arrange for acquisition of the necessary private patent claims or portions thereof from their present owners and of certain San Juan National Forest tracts from the Forest Service pursuant to the Small Tracts Act. The lime addition facilities, the ponds, and the repository will be located on lands that will be transferred to the North Rico Trust. Atlantic Richfield will fund, own, and operate the constructed water treatment system and treatment solids facilities.

The water treatment system facilities will be accessed using an existing road that currently is subject to a Forest Service Road Use Permit held by Atlantic Richfield. Upon consolidation and transfer of the subject lands to the trust, Atlantic Richfield will control use of the road to prevent interference with operation of the water treatment system.

7.0 ARARS

The Action Memorandum for this Site has identified federal and state ARARs. The ARARS are attached to the Action Memorandum and will be followed to the extent practicable. These ARARs include substantive provisions of applicable or relevant and appropriate requirements. These do not include administrative requirements that may be associated with the applying for and issuance of permits set forth in the State of Colorado or in Dolores County.

8.0 SCHEDULE

The schedule for the tasks described in this Work Plan is shown below.

Previous Work/Site Studies Delivered to EPA		April 1, 2011
Task A - Pre-Design And Ongoing Site Monitoring		
A1	Ongoing Water Quality and Flow Monitoring	
	Flow monitor installation	March 31, 2011
	Quarterly downloads	begins June 2011
A2	Seasonal Water Quality and Flow Monitoring	
	SAP/QAPP	April 1, 2011
	First sampling event	April, 2011
Task B – Management of Precipitation Solids in the Upper Settling Ponds		
B1	Develop Initial Solids Removal Plan	May 1, 2011
B2	Drying Bed Construction and Solids Removal, and Solids Management	
	Mobilization and site preparation	June 6, 2011
	Pond 18 solids removal	July 6 – December 1, 2011
	Downstream ponds solids removal	July 2012 – December 2013
	Permanent drying facility design	March 2012
	Permanent drying facility construction	Completed by December 2012
B3	Pond Stability Analysis and Upgrades	
	Pond stability analysis (Geotechnical and Hydrology)	September 2011
	Embankment armoring	December 2011-August 2012
	Stability upgrades – structural	(see Task F schedule)
Task C – Design and Construction of a Solids Repository		
C1	Develop a Repository Design and Operating Plan	
	Submit Repository Design and Operating Plan	October1, 2011
	Permitting (not required; anticipated timing)	Complete by May 2012
C2	Solids Repository Construction and Initial Solids Placement	Completed by October 2012
	Mobilization	June 2012
	Construct repository	June – October 2012
	Placement of dried Pond 18 solids	December 2012
	Placement of downstream ponds solids	June 2013 – December 2014
Task D – Hydraulic Control Measures for the Collapsed area of St. Louis Tunnel Adit		
D1	Adit Collapse Area Investigations Plan	July 15, 2011
	Adit and Portal Investigation Report	December 8, 2011
D2	Preliminary Design of Hydraulic Controls of the Adit Discharge	
	Preliminary Design Report	March 1, 2012
D3	Final Design and Construction of Adit Hydraulic Controls	
	Final design	June 15, 2012
	Construction	August – November 2012
Task E - Source Water Investigations and Controls		
E1	Review Existing Data	April – July 2011
E2	Additional Investigations	July 2011 – September 2012
E3	Evaluation of Hydraulic Controls Alternatives	October 2012

E4	Mine Water Source Controls - Design and Construction (Pending E3 Findings)	
	Preliminary design and Additional Data Collection	March - June 2013
	Final design	July 2013
	Construction	August 2013

Task F – Water Treatment System Analysis and Design

F1	Preliminary Water Treatment Technology Alternatives Screening Report	August 2011
F2	Treatment System Conceptual Designs and Additional Investigations	June – October 2011
F3	30-Percent Design Report	June 2012
F4	Final Design and Construction of the Water Treatment Facility	
	Final Design	December 1, 2012
	Construction	May – November 2013

9.0 REFERENCES

Atlantic Richfield Company. 2008. Technical Memorandum on Mixing Zone Analysis for the St. Louis Ponds Discharge, Rico, Colorado. July 1, 2008.

CDPHE. 2008. Water Quality Assessment, Mainstem of the Dolores River, St. Louis Tunnel Discharge, October 29, 2008.

Paser, K. 1996. Characterization of and Treatment Recommendations for the St. Louis Adit Drainage and Associated Settling Ponds in Rico, Colorado. Colorado School of Mines Master's Thesis.

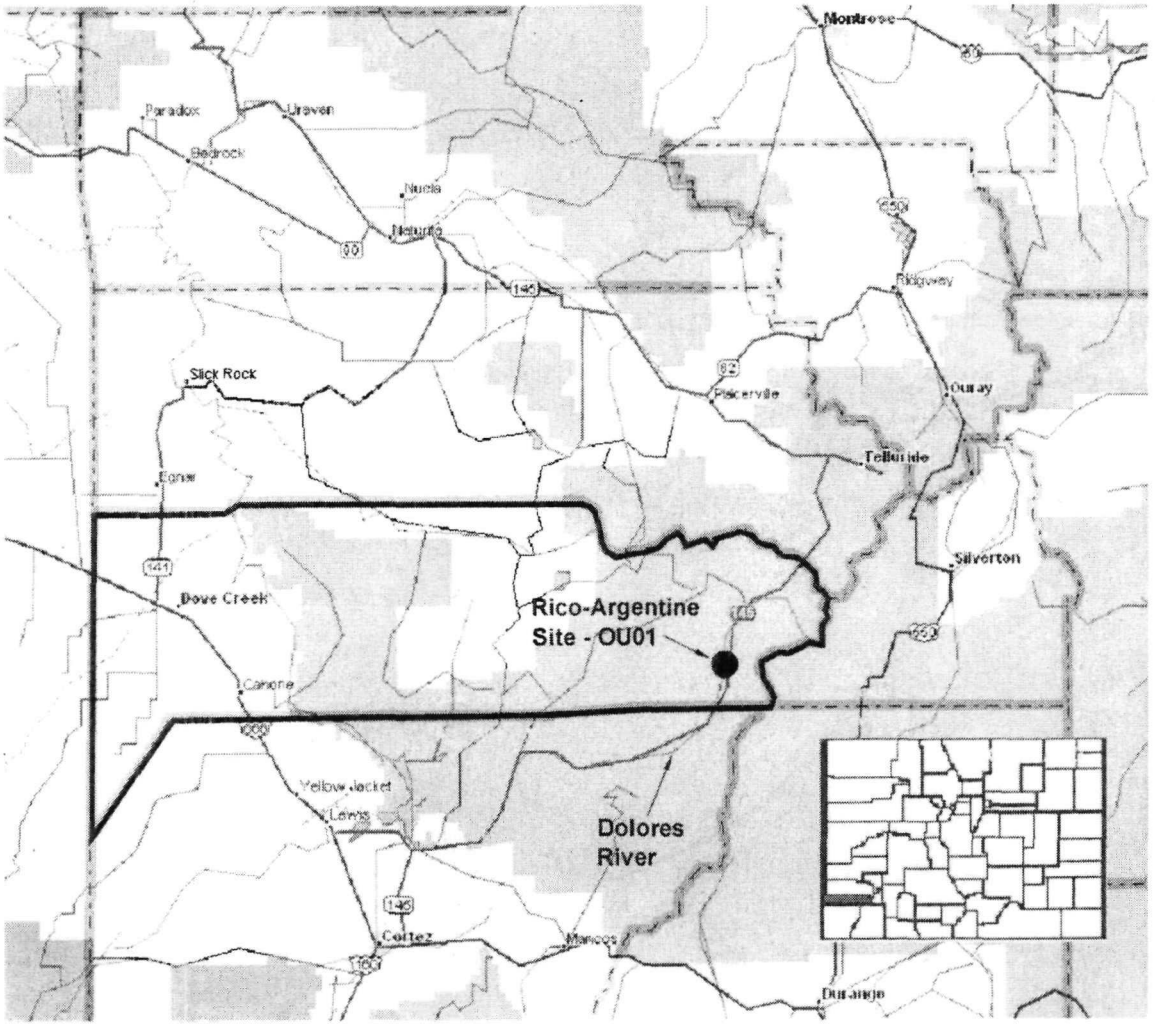
TABLE 5-1
Surface Water Sample Locations

Site ID	Site Description
DR-4SW	Dolores River below Silver Swan
DR-1	Dolores River above St. Louis settling pond system
DR-2	Dolores River immediately above the St. Louis settling pond system outfall
DR-3	St. Louis tunnel discharge at adit
DR-4	Discharge of Pond 15
DR-5	Discharge of Pond 8
DR-6	St. Louis settling pond system outfall to the Dolores River
DR-7	Dolores River below St. Louis settling pond system outfall
DR-G	Dolores River at USGS gauging station #09165000

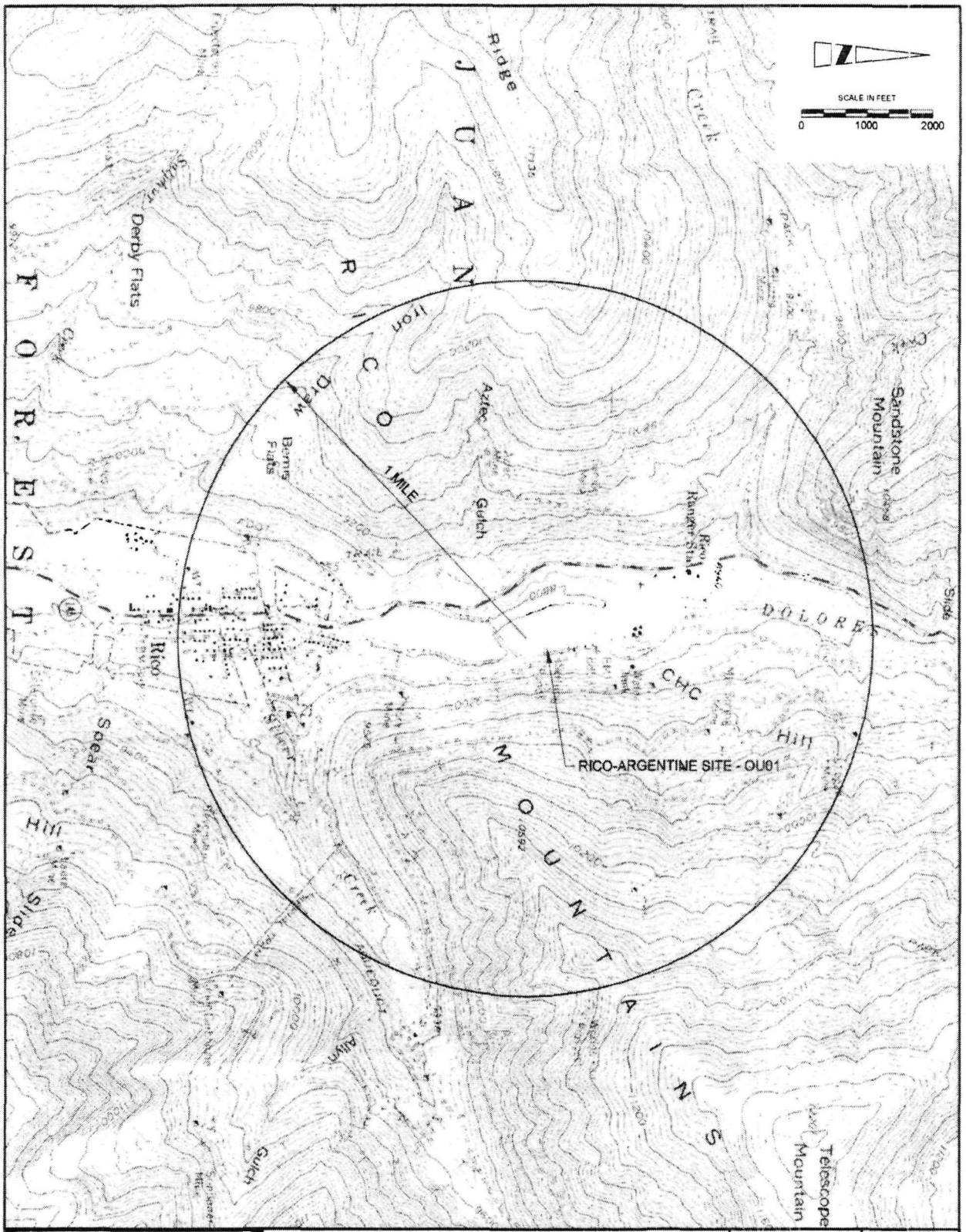
TABLE 5-2
Surface Water Sample Analysis

Field Analyses	Laboratory Analyses	
	Non-Metals	**Total and Dissolved Metals**
pH	Alkalinity	Aluminum
Temperature	Hardness (total, Ca, and Mg)	Antimony
Conductivity	Total Dissolved solids	Arsenic
Dissolved Oxygen	Total suspended solids	Barium
	Salinity	Beryllium
		Cadmium
		Calcium
		Chromium
		Copper
		Cyanide
		Iron, dissolved and total recoverable
		Lead
		Magnesium
		Manganese
		Mercury, total recoverable
		Nickel
		Potassium
		Selenium
		Silver
		Sodium
		Thallium
		Sulfate
		Vanadium
		Zinc

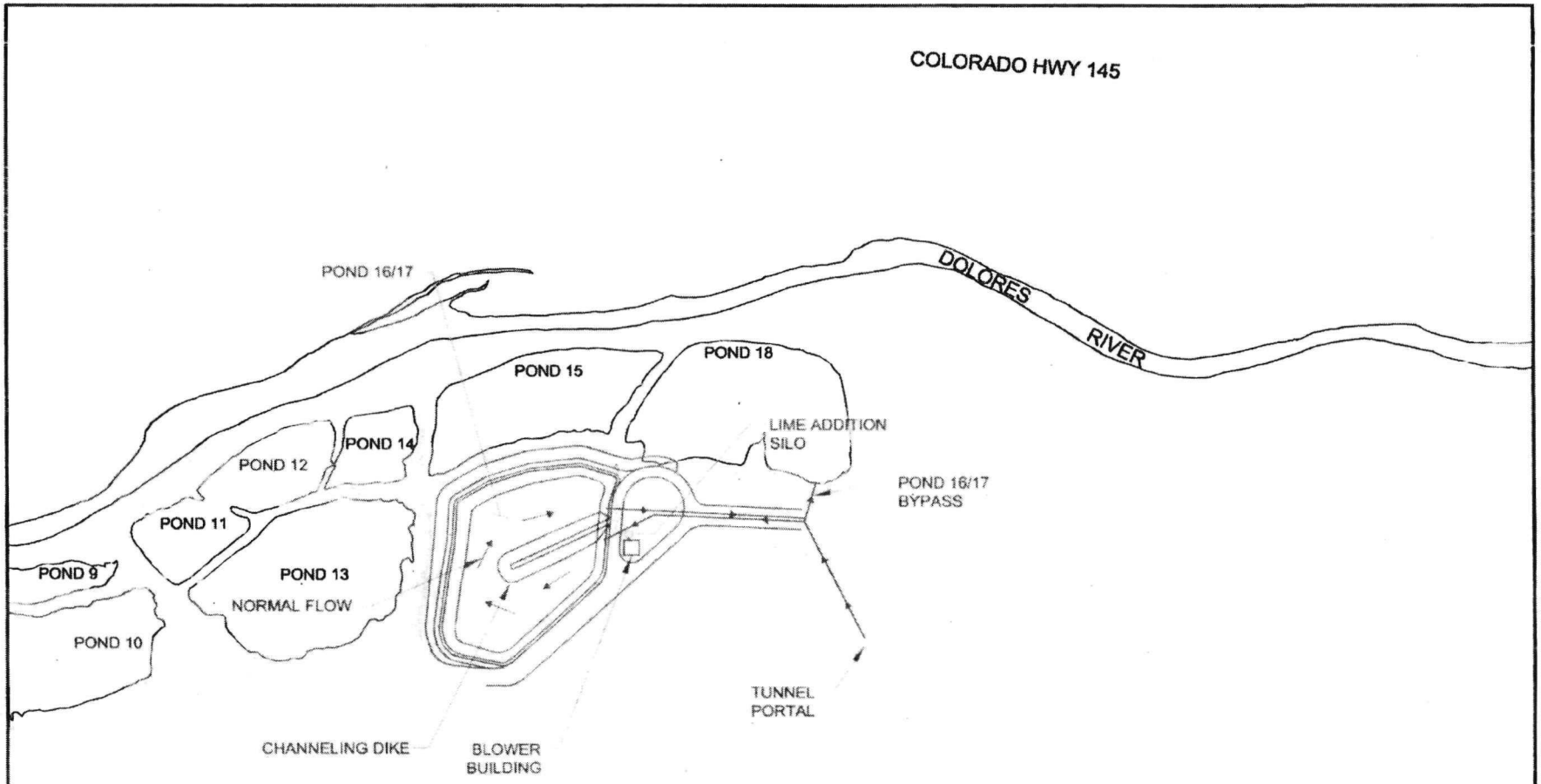
Figures are attached as a separate file due to file size constraints.



AECOM AECOM Technical Services, Inc 717 17th ST., SUITE 2600 DENVER, COLORADO 80202 T 303.228.5000 F 303.228.3001 www.aecom.com	RICO-ARGENTINE SITE - OU01 REMOVAL ACTION WORK PLAN REGIONAL MAP	AECOM PROJECT NO. 60157757	FIGURE 3-1



AECOM AECOM Technical Services, Inc. 717 17th ST., SUITE 2600 DENVER, COLORADO 80202 T 303.228.3000 F 303.228.3001 www.aecom.com	RICO-ARGENTINE SITE - OU01 REMOVAL ACTION WORK PLAN	AECOM PROJECT NO.	FIGURE
	LOCATION MAP	60157757	3-2



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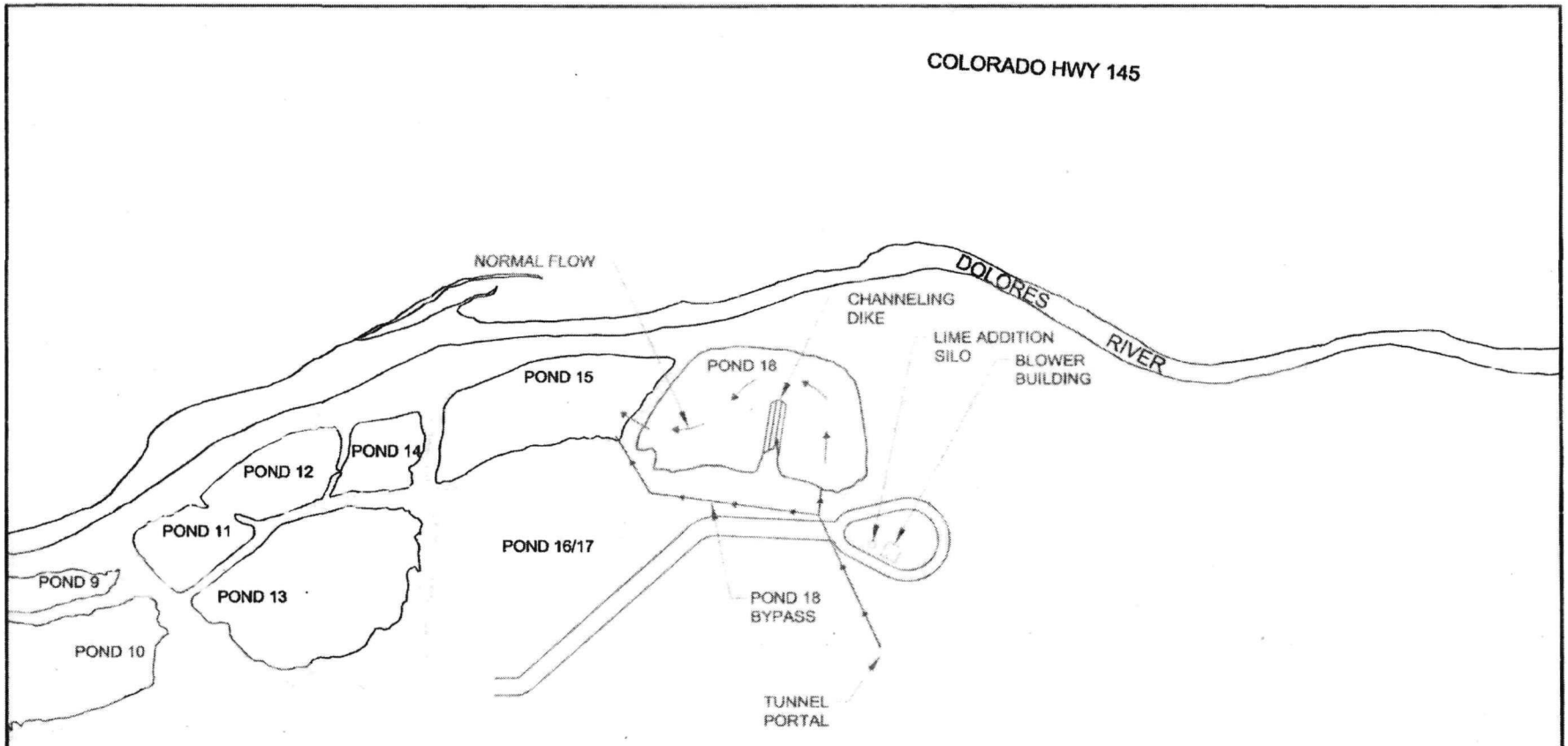
RICO-ARGENTINE SITE - OU01
REMOVAL ACTION WORK PLAN

POND CONFIGURATION & FLOW SEQUENCE
ALTERNATIVE 2

AECOM PROJECT NO.
60157757

FIGURE
5-5



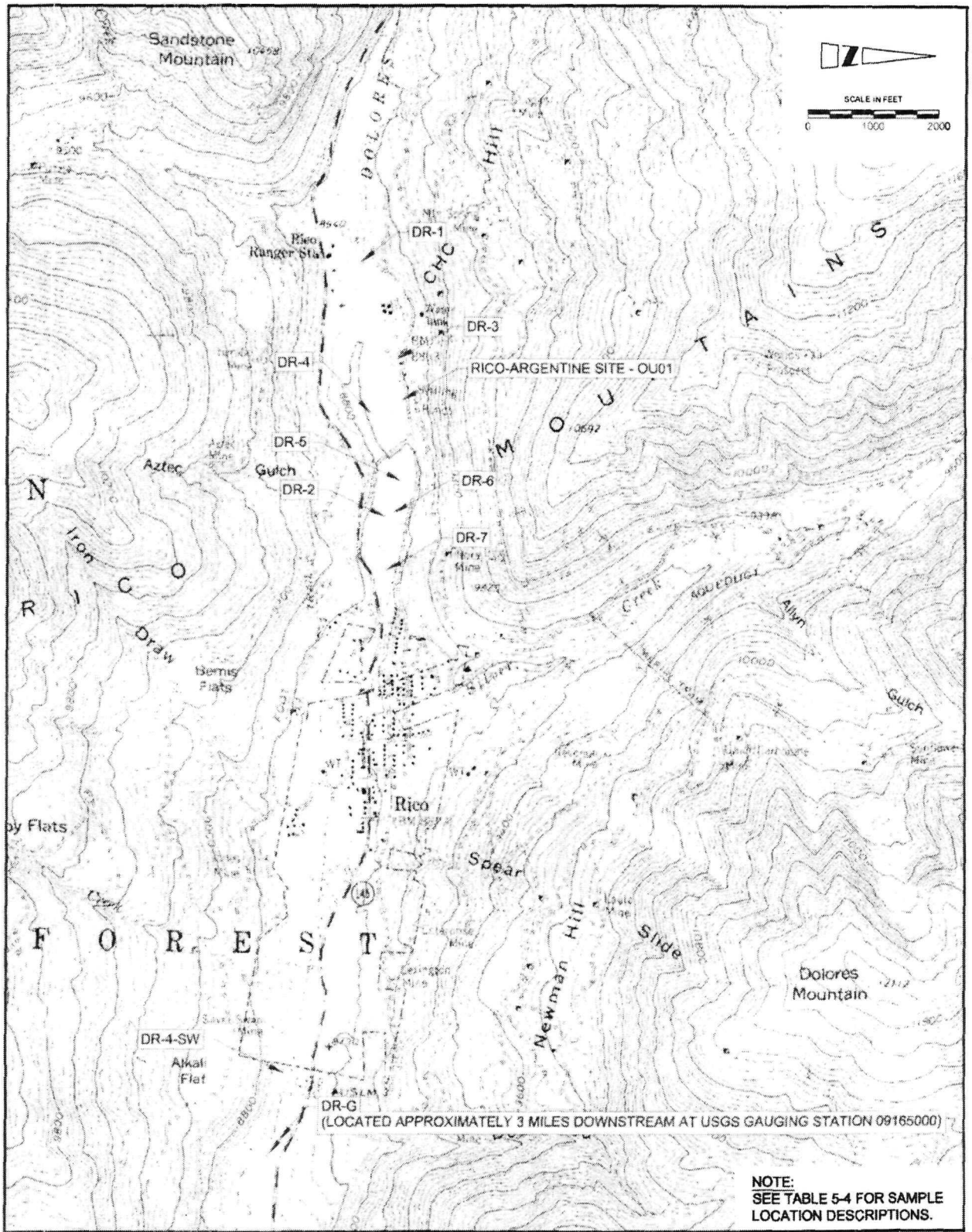
AECOM

RICO-ARGENTINE SITE - OU01
REMOVAL ACTION WORK PLAN

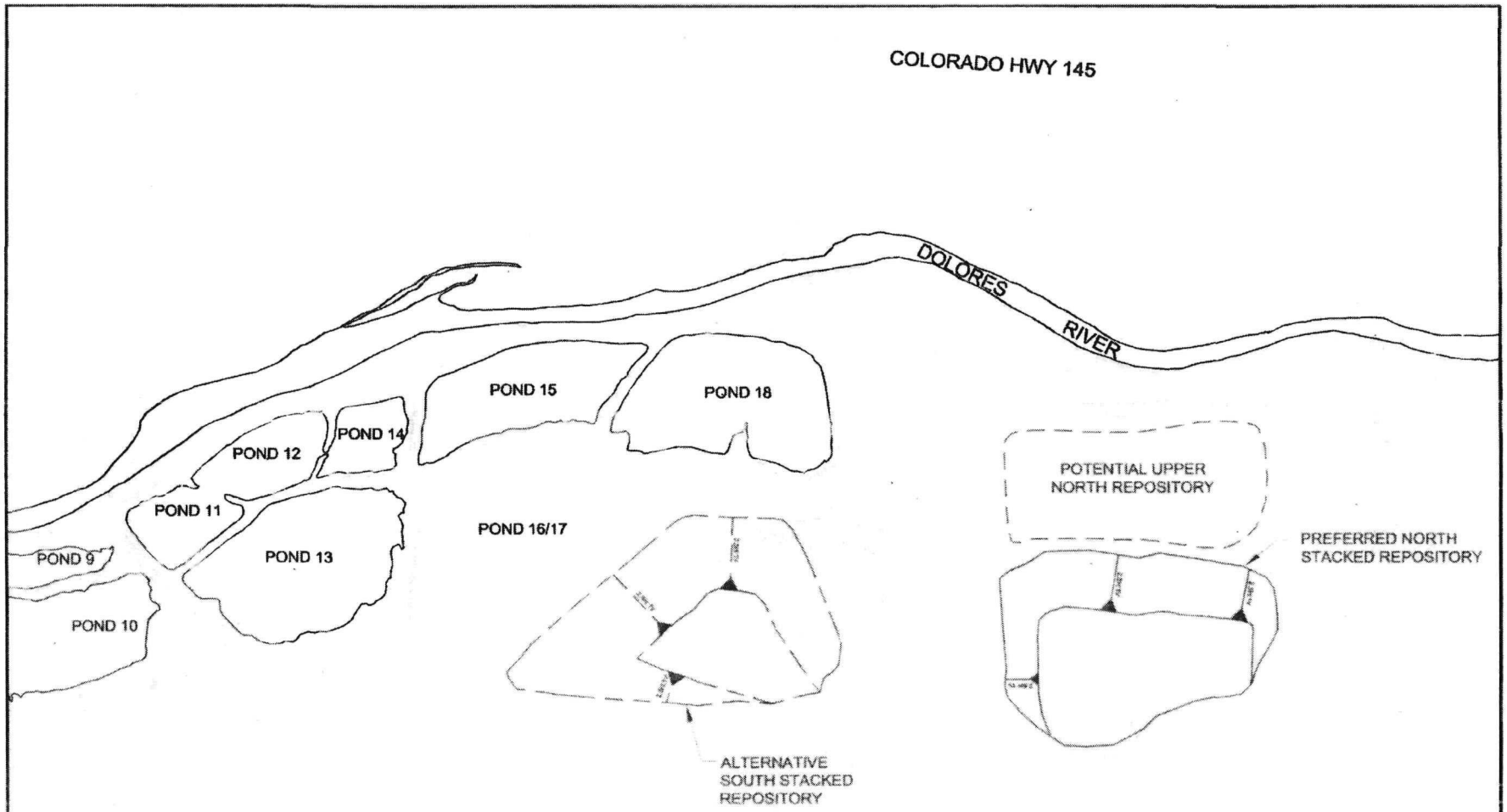
POND CONFIGURATION & FLOW SEQUENCE
ALTERNATIVE 1

AECOM PROJECT NO.
60157757

FIGURE
5-4



AECOM AECOM Technical Services, Inc 717 17th ST., SUITE 2600 DENVER, COLORADO 80202 T 303.226.5000 F 303.226.3001 www.aecom.com	RICO-ARGENTINE SITE - OU01 REMOVAL ACTION WORK PLAN SURFACE WATER SAMPLING STATIONS	AECOM PROJECT NO. 60157757	FIGURE 5-3



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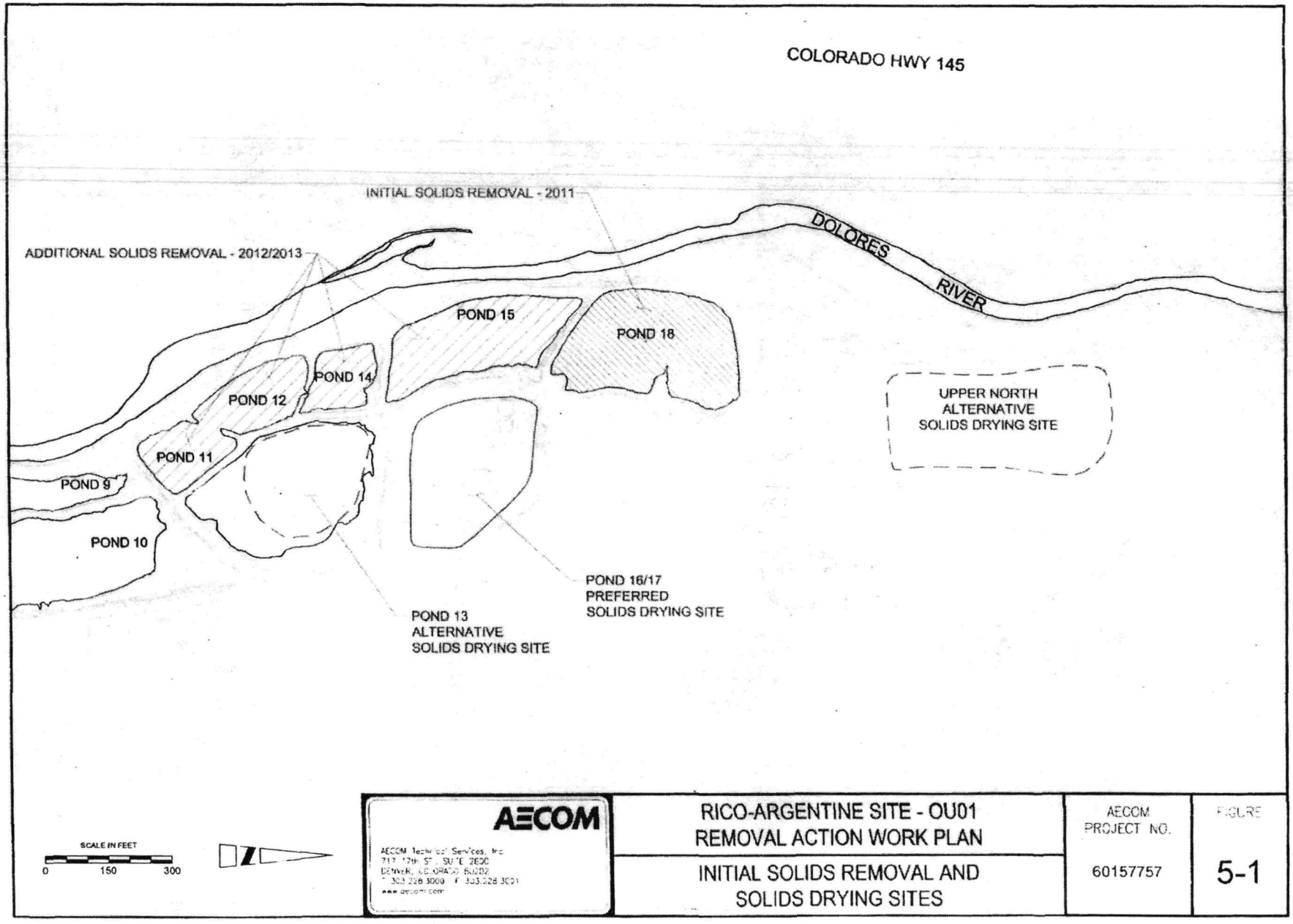
RICO-ARGENTINE SITE - OU01
REMOVAL ACTION WORK PLAN

SOLIDS REPOSITORY SITING

AECOM PROJECT NO.
60157757

FIGURE
5-2



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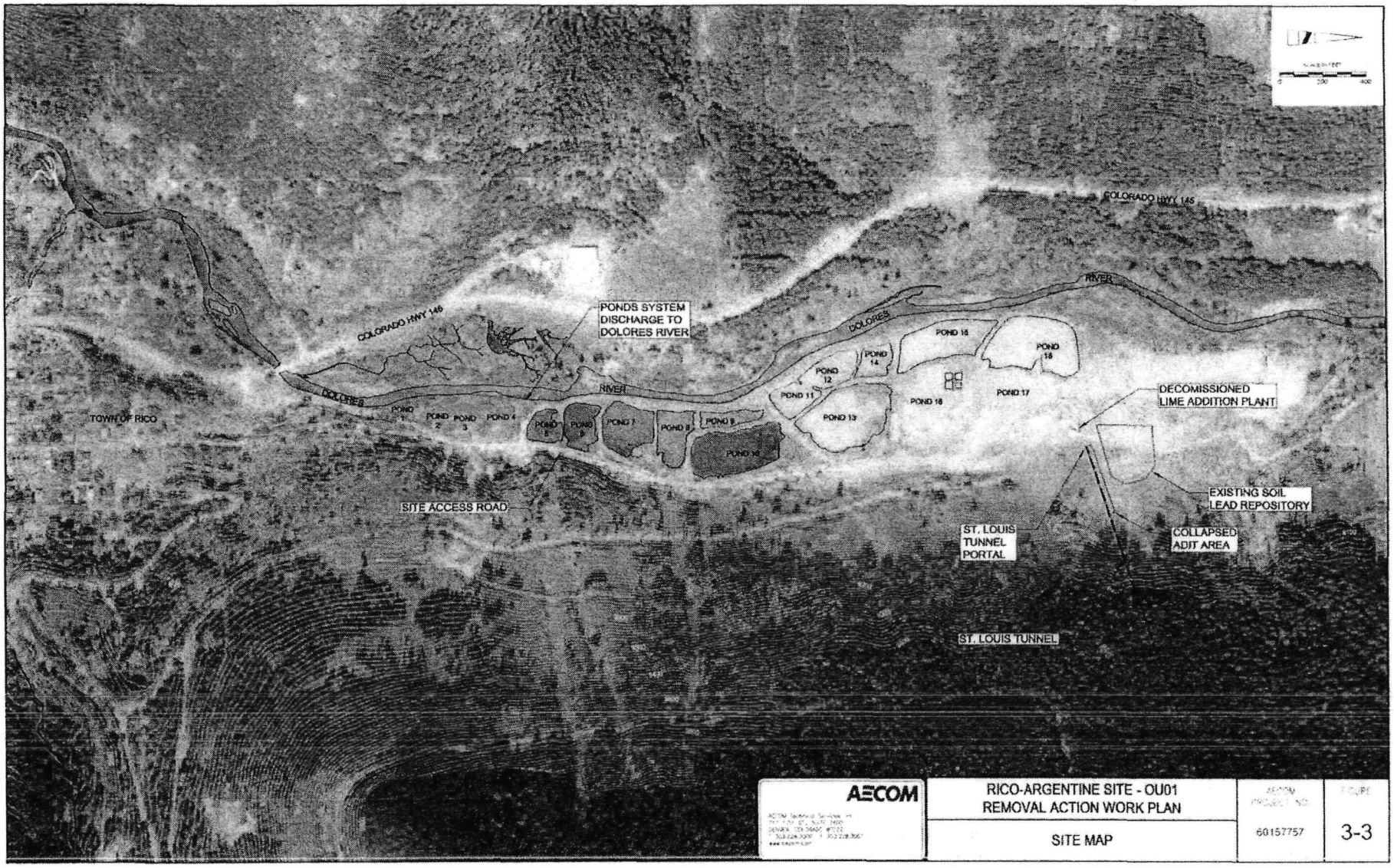
RICO-ARGENTINE SITE - OU01
REMOVAL ACTION WORK PLAN

INITIAL SOLIDS REMOVAL AND
SOLIDS DRYING SITES

AECOM PROJECT NO.
60157757

FIGURE
5-1



AECOM	RICO-ARGENTINE SITE - OU01 REMOVAL ACTION WORK PLAN	AECOM PROJECT NO.	FIGURE
	SITE MAP	60157757	3-3